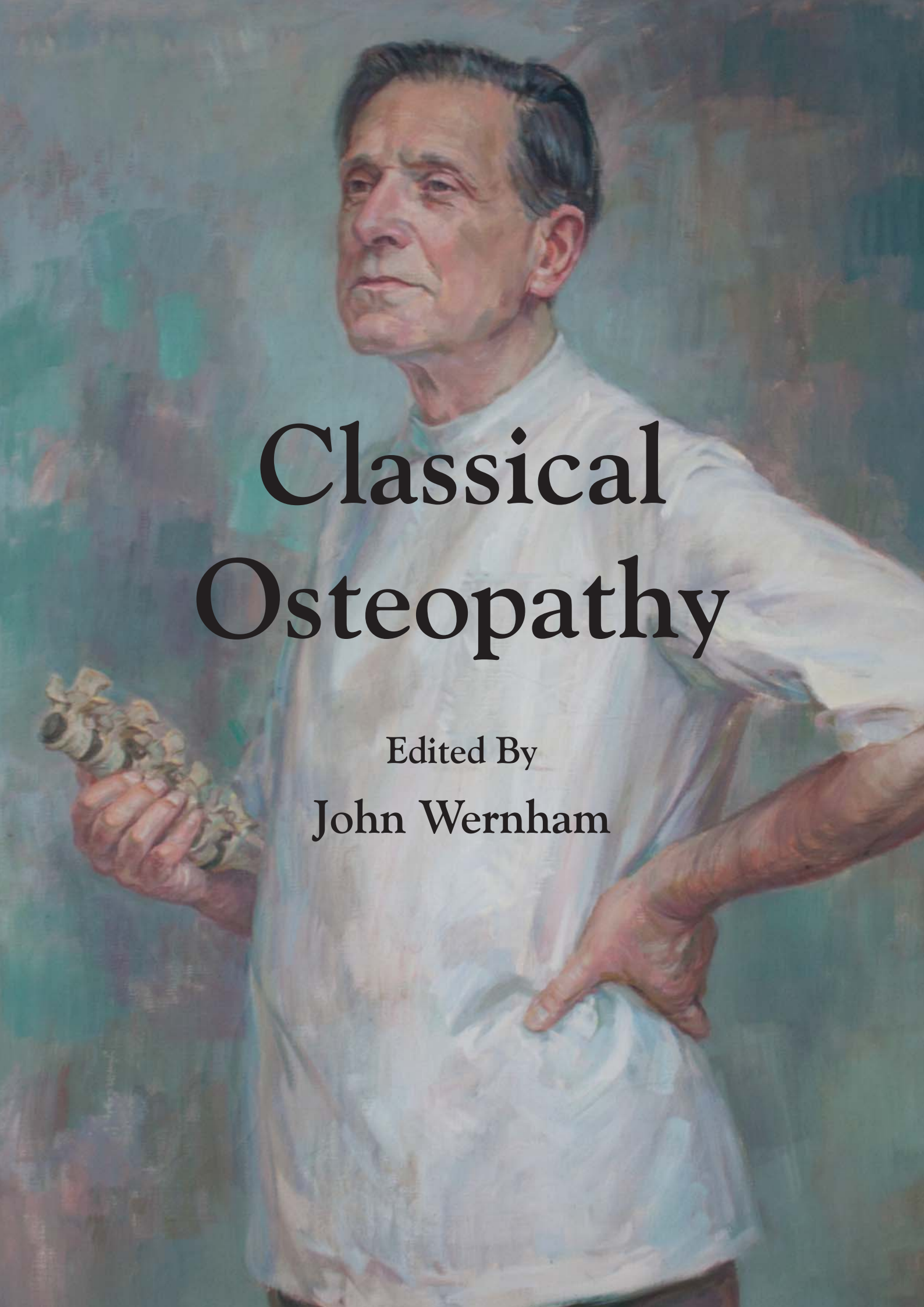


A painting of a middle-aged man with dark hair, wearing a white lab coat, looking upwards and to the left. He is holding a human vertebra in his right hand and pointing with his left index finger to his lower back. The background is a textured, abstract mix of green, blue, and brown tones.

Classical Osteopathy

Edited By
John Wernham

FOREWORD

The Osteopathic Institute of Applied Technique began with a series of lectures given during the year of 1954 at quarterly intervals and at the invitation of the Management Committee of the Maidstone Osteopathic Clinic. Its purpose was the preservation of the Principles, Technique and Practice of Osteopathy as laid down by Still and Littlejohn.

The lectures were given by the Founder Members and invited guests. These were then collected and published in a Year Book dating from 1956. Long since out of print it was considered that such valuable material should be made available to a generation of students and practitioners who have had little opportunity to become acquainted with the fundamental teaching of osteopathic philosophy.

Other contributions to our publications included research from earlier records from the work of the American pioneers in osteopathic development. In its history of little more than a hundred years, there can be no doubt that the osteopathic concept has made an impact on twentieth century medicine that is more than remarkable, but if we are to continue and retain our separate identity we must look to our past in association with the present in building a secure foundation for the future.

Maidstone 1996

John Wernham

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THE PROPHYLACTIC AND CURATIVE VALUE OF THE SCIENCE OF OSTEOPATHY

J. MARTIN LITTLEJOHN

For the first time in Europe and in this metropolis of the world I desire to present the claims of this new science. I appear as the apologist of the new science, because, having examined its claims, I find that they are based on scientific principles which are the common property of the medical profession. It is not unfitting that to this ancient scientific corporation the first exposition and defence of osteopathy should be offered. Your charter rights as a Royal Society give you the privilege and honour of branding any scientific truth as genuine and to you belongs the right of disseminating it among the common people. I am encouraged by the lines of Hamlet, addressed to Horatio:

*There are more things in heaven and earth,
Than are dreamt of in your philosophy.*

It is something to have the privilege in these closing years of the nineteenth century to live and take part in scientific efforts and movements that promise to crown civilization with its highest glory. In the field of medicine changes are taking place unheard of in by-gone generations. In other fields of literature and science artificiality is giving place to naturality. Accumulations that have been added to science are being unloaded and we are being led back to the simpler and more sure methods of nature. An ancient scholar has this exalted praise of the healing art: "Man in nothing comes nearer to the Gods than in giving health to his fellow mortals".

Science is ever progressive, every new decade opening up depths and heights in the scientific field hitherto unthought of. No science and art has been subject to so many changes as that of medicine. We use medicine in the widest sense here. Dr. Malcolm Morris, FRCS, in writing on the progress of medicine during the Queen's reign, defines medicine as including "the whole art of healing, and the laws upon which this practice is based". The science of medicine is not limited to drugs or their prescription and use; in fact, the therapy of the modern university medical college is rapidly discrediting drugs. The *Encyclopaedic Dictionary* defines medicine as "a science and art directed, first to the prevention of diseases, and secondly, to their cure". Only a very small place in the educational programme is devoted to drugs. Anatomy, physiology, pathology, symptomatology and

diagnosis have found their guardians and promoters and defenders in these schools, and if we set aside pharmacology there is still left a large field of medical education.

Gradually people are realizing that there are more scientific means of curing diseases than by the use of mysterious and uncertain drug potencies. Almost instinctively people in every land seem to be turning in the same direction, towards a system in which the main principle is the adjustment of the mechanism to itself and the harmonizing of its organic functions. Pain is found where a contracted muscle presses on a sensory nerve, loss of muscle function or paralysis if it presses on a motor nerve. The misplacement of a bone, ligament or muscle, the obstruction of a blood vessel calls for the mechanical skill of an operator to replace the misplacement or to remove the obstruction so that in freedom the system may play normally. Nerve inactivity, fluid congestion or stagnation, or the collection of diseased or germ-laden fluids in the system call for the mechanical liberation of the affected parts, and in this liberation lies the secret of health restoration and the removal of sickness and disease. Scientific investigators all over the world are beginning to recognize that we must take account of the structure and functions of the body in applying our therapeutics on a basis of adaptability to conditions.

Dr. Willock, MRCS, in calling attention to new treatments for the chest, says these methods of dealing with these diseases "have thrust drugs from the unique position that they held. They have emphasized the fact that something else other than pharmaceutical products has an important remedial action upon pathological conditions of the respiratory and circulatory systems. Of all the several systems upon whose uninterrupted functional activity the continuance of life depends, these two are those over which we have most mechanical control, and it is by mechanical means that we can obtain a considerable and important therapeutical effect in certain unhealthy states of the heart and lungs." In regard to the application of mechanical treatment, he adds, that in this way "the strain upon the impoverished tissue is diminished and its vitality prolonged. In addition the effect of continued movements upon elastic and muscular tissues, provided undue effort is avoided is to develop them." Here we have the statement that mechanical movements give us an increased functional activity and an increased nutrition. If we add to this the facts that physiologically nerve stimulation may be promoted, blood and lymph circulation freed and obstructions taken out of the way by mechanical

means so as to free the nerve force, the blood, the lymph, and the peristaltic movements of the tissues, we have the fundamental basis of osteopathy.

We owe a debt of untold gratitude to predecessors who have tilled the fields of anatomy and physiology, both normal and morbid and made it possible for us to apply the principles of osteopathy with precision and definiteness to the human system. The principle of osteopathy is a time-honoured one, *similia similibus curantur*, in the sense that the only rational and scientific method of curing disease is based upon nature. Nature has won victories in other fields. In the field of education nature won a victory in discarding the old system of cramming and making education the stimulation of mental development by the skilful communication of knowledge by nature's method. Nature can do the same in the field of medicine, by removing everything that is unnatural; it can permit recourse to the perfect medicine laboratory of life, out of which the soothing draughts of nature flow to diseased parts.

Allbut, in his new system of the practice of medicine, makes this statement: "We give drugs for two purposes: (1) to restore health directly by removing the sum of the conditions which constitute disease. Here we act empirically with no definite knowledge – often indeed with little idea of the action of our drugs; (2) to influence one or more of the several tissues and organs which are in an abnormal state, so as to restore them to or toward the normal. This purpose we effect by means of the influence which the chemical properties of the drugs exert on the structure and function of the several tissues and organs". Drug therapeutics is empirical, lacking in exactness and scientific accuracy. Recognizing that medicine is applicable in a wider field, we attempt to go to the scientific basis of therapeutics, seeking to find why an organ or tissue is in an abnormal condition, using symptoms and morbid conditions as means to the discovery of causes, or at least using them as secondary causes. By a careful physical examination of the condition of the nervous and vascular supply to the local parts with the view of finding and removing any irritation or impingement in connection with these forces that supply the part, a basis is laid for correction of the condition by manipulation – this is osteopathy.

The theory of medicine or the healing art – for I take these as synonymous – is that from a physiological standpoint it is possible to employ scientific means to preserve and prolong life, and when life is attacked or threatened by disease, accident, or malpractice, then certain physiological principles may be brought into operation in connection with

the body system to cure or alleviate these conditions that threaten to destroy life or to interfere with and lessen health and happiness. In all ages attempts have been made to apply measures to the human system with this end in view. Arising out of these attempts to preserve and prolong life and free it from disease, we have the medical profession which from the most remote antiquity has established its right to deal with disease, recognized its moral and legal responsibility in dealing with human life and health, and has attempted to make life more pleasurable and therefore more happy to the living and even to the dying. Custom together with the formulated laws of different nations has given legal sanction to this profession that aims to prevent disease, to prolong life and increase the comfort of life.

No empirical standard has ever been laid down with unerring sanction as the accredited standard of measures to be adopted to secure these ends. From a remote past, magical measures and hypnotic influences in the hands of a priestly class of physicians played a most important part in this service; with the discovery of the medicinal properties of plants, minerals and certain extracts of animal tissues and organs, these were employed as medicinal agents; blood-letting and blistering were resorted to in the attempt to counteract certain supposed influences at work in the body organism. Certain vibratory and massage movements were found to have a bearing on body metabolism and organic functioning and these were adopted as remedial agents.

It was found by Hilton and others that the principle of rest applied to the organism or its parts, otherwise in active operation or overworked, brought to this over-active organ or hyper-functional part of the organism a new and therapeutic principle in permitting nature itself under the influence of dietetic recuperation to restore the harmony of all its parts and therefore to restore health. Others have found that heat and cold when applied to the body have an important influence in modifying circulatory and nerve conditions so that these thermal agents may be actively used in restoring towards the normal. Light has been found to have a marked therapeutic effect on the animal organism, a light of low refrangibility affecting the chemical processes and a light of high refrangibility producing mechanical changes in the organism, modifying growth and tissue tension in relation to the organic movements.

The latest attempts to apply the therapeutics of nature comes in connection with osteopathy. It may be best described as a physiologico-medical attempt to restore harmony to nature on the basis of the human

organism as a perfect mechanism without external medication. Men in other fields, especially since the time of Virchow, have been led by the study of biology and physiology to regard the cell as the vital unit capable of nutrition and reproduction, and on these fundamental functional bases capable of cell renewal and of forming in connection with a mass of such living cells the organism as a “summation of living unities, every one of which manifests all the characteristics of life”. Side by side with this we find that nerve force, representing the function of the master tissue of the body, contains within it the secret principle of trophic functional control exercised in every organism of living tissues, the minutest nerve tentacles, more especially in the sympathetic or involuntary nervous system, controlling the necessary vital processes essential to the life of the organism. In almost every laboratory in our European Universities we find men delving deep into these physiological and biological processes with the object of finding out, if possible, the secret of life in the cell and in the organism, and to account, if possible, for all of those vital processes that take place in the renewal of the cell and organism life.

The old science of medicine represented by drugs began to fall long ago by the attacks of scepticism which always come before truth. In Molière’s plays we find an inimitable picture of one who was by nature a semi-fool turned by art into a physician. His mind, as Goethe puts it, “was well broken in and laced up in Spanish boots”. “After many strokes of the hammer on the iron” he got his diploma; his highest recommendation being that he followed blindly the opinions of his forefathers. Today we live in the age of freedom. In 1566 the Faculty of Medicine in Paris started the movement by an unanimous decree passing this resolution: “That antimony is deleterious and to be counted among the poisons. Nor can it be amended by any other preparation so as to be taken without injury”. In 1615 the same faculty unanimously interdicted drug vendors, and called on all judges to deal severely with those who prescribe, administer, or exhibit for sale the said medicines. Both of these Acts were ratified by the French Parliament, and were in force for one hundred years. It was reserved, however, for osteopathy to treat the blood not only as the means of life, the thread that welds the diverse tissues of the body into one under the guidance and control of master nerve tissue, but to regard the blood and the nerve force as the medicine of nature. It was only yesterday that we began to look on the body as a great living mechanism. In order that its vital forces may be unobstructed, the different parts of the machine must operate in harmony, the skeleton must be adjusted to every motion of bone

ligament and muscle; pure air must penetrate every minute cell of an unimpeded lung and every minute recess of healthy tissue; pure blood must circulate in every organ and tissue, and a perfect nerve substance with an irrepressible organic force must animate every tissue and pass through every region of the body. To see that this is the condition of the body is the function of osteopathy.

Osteopathy claims that to administer inorganic drugs internally is harmful to the system. In this it is supported by some of the most eminent physicians who represent the tendency of anti-drug therapy. The illustrious Hilton, of world reputation, the author of *Rest and Pain*, advocated the now celebrated rest cure. Among others we find Dr. Keith in his *Plea for a Simpler Life* and *Fads of an Old Physician* vigorously defending the same principle, and in a few of his scattered references he anticipated osteopathic treatment, especially in connection with angina pectoris. The celebrated manual treatment of Ling has many features that are suggestive of osteopathic therapeutics. Dr. Wm. Osler, throughout his splendid work on the "Practice of Medicine" discountenances the use of drugs as unavailing and insufficient therapeutically, reaching the climax, when in speaking of the causes of diseases he specifies, "that most injurious of all habits, drug taking" as one of the almost constant causes of disease. Dr. Lauder Brunton of St. Bartholomew's Hospital, London, makes this statement in connection with headache that is osteopathic in principle, when he says that there is "in migraine a dilatation of the proximal parts of the carotid artery with a contraction of the peripheral part, and that if I take off the strain from the vessels by pressing the carotid the pain is at once relieved". Osteopathy takes up the principles enunciated by such men as these found scattered over the field of medicine, carrying to their logical conclusion the principles that underlie their work, namely, that mechanico-therapeutic measures if systematically and physiologically applied may form the basis of the prevention and cure of diseases. Medical science is now passing from infancy to manhood, gathering up the copious generalizations of past history so as to subject them to the inductive examination necessary to their testing. Osteopathically we are attempting to reduce an art to a science. This represents the modern spirit of scientific research, in virtue of which we hope to raise out of the dead dogmatisms of the past the new science in connection with clinical work in the hospital and scientific work in the laboratory.

Here we find the starting point of what we believe will certainly revolutionize the field of medicine. The field of osteopathy is very wide,

taking in the entire therapeutics of disease both bodily and mental. It began by demonstrating its therapeutic value in the case of alleged incurable conditions. It has branched out in every direction until today it covers the whole field of medicine. Osteopathy was first formulated by Dr. A. T. Still in 1874. His own account of it gives us the initial point of view from which he looked at it. He claimed "that a natural flow of blood is health; that disease is the effect of local or general disturbance of the blood; that to excite the nerves causes the muscles to contract and compress the venous flow of blood to the heart and that the bones could be used as levers to relieve pressure on nerves, veins and arteries". He conceived the idea that the human system is a machine, perfectly formed by its maker and if kept in a condition of proper adjustment it is capable of surviving for a long time. He found that manipulation could be made, almost at will, in connection with the skeletal structure, with the result that all the organs could be stimulated to perform their normal functions. Out of this beginning there has been developed a system of manipulative therapy aiming at rectifying all the abnormal structural and functional disorders of the system.

While osteopathy repudiates drugs, it claims to be the heir of all that is scientific in the past history of medicine. Its principles have lain buried beneath the massive literature of all other systems of healing and have been used at times in the combat against disease; but the fundamental principles have never yet been fully systematized with a view to their application from a prophylactic and curative standpoint. While it is in the main dependent on scientific manipulations, it is not exclusively the science and art of manipulation. It takes in and uses all the therapeutic principles that have been tested from the standpoint of nature, including the mechanical correction of misplaced tissues, bones, etc.; the use of proper hygienic and dietetic principles, and in fact any principle that is in line with the natural laws of the human body. Osteopathy differs essentially from all other systems in its account of the etiology of diseases and in the curative principles utilized. From an etiological standpoint diseases are found to be very often due to structural derangements in the anatomy of the body, whether these are found in the osseous muscular or neural systems. Here osteopathy claims to have stepped ahead of the rest of the medical profession. Medicine has been very largely occupied in discussing and exploring the field of drug action upon the tissues and organs forgetful of the fact that the chemicals of life lie hidden in the laboratory of human nature. Osteopathy claims that in substituting the laboratory of human nature for the laboratory of the chemist and experimental physiologist, it is

getting closer to human nature and applying more scientifically anatomical, physiological and chemical principles. We are not trying to undermine the therapeutics of the older schools, but rather, from a humanitarian standpoint, to substitute what we consider a more rational system of healing. From this standpoint if every tissue of the body anatomically and functionally is correct health must of necessity result. Hence from an osteopathic standpoint any displacement of any of the tissues of the body may result, and if continued, must result in an abnormal condition. This applies to muscle, bone, ligament, tendon, nerve tissues, etc.

How do these changes in the form of displacement arise? It is easy to understand how a strain, over-exertion, a fall or any ordinary external or atmospheric change may so affect the tissues as to produce displacement, to cause contraction, strain or dilatation of the structural form of the tissues so as to interfere with the proper flow of the fluids and forces of the organism, thereby producing an abnormal distribution of these fluids and forces. These fluids and forces represent essentially from a biological standpoint the vital and vitalizing principles and forces of the organism. It is easy to understand how changes in the air, whether moist or hot, drafts, excessive exposure to sun, rain, wind, etc., may modify the muscles, and other tissues of the body. In this tissue modification, involving contracture, there is necessarily an interference with the superficial blood supply and tension of the superficial nerve fibres; if this contracture becomes excessive there is a strain on the muscles in their attachments, traction brought to bear on the bones and tendons, with the result that spinal articulation, vertebral and rib connection become abnormal. In this condition there is a decided interference with the muscular and nervous substance so that nerve force and fluid supply become pathological. The same conditions are found to be produced by the mischances of daily life, a strain, an undue twist of the body, a slip or fall, or perhaps the attempt to evade such a slip or fall – any of these exerts an influence on the tissues, tending to displace the tissue structures and also interfere with the nerve force and fluid supply to the parts. Often a vigorous nature and native strength of body are able to rectify these conditions; but often nature is weak and cannot of itself restore to the normal. Here osteopathy steps in to assist nature by so manipulating the body as to correct these wrong conditions.

Osteopathy does not ignore the fact that there are many indirect causes that may be classified under the head of predisposing causes distinguished from the direct causes of disease or diseased conditions. Heredity, environment, especially from a sanitary and hygienic standpoint, bacilli of

multiform variety, infected germs come into play in producing disturbances of function and causing disorder in the tissues of the body locally or generally. Osteopathy claims that often behind these is to be found the real cause of the disease, these secondary conditions simply furnishing the means or medium for the action of a perverted function and therefore involving a derangement of the tissue.

When these conditions are found the question arises, how can they be removed? Wherever there is a structural change a disordered function or derangement of tissue, it would seem natural to suggest the correction of the lesion. The surgeon when he finds a dislocated joint or a broken bone uses his mechanical skill in setting the joint and the bone. If a rib is displaced or a vertebra out of its normal position, if a muscle is contracted, involving impingement upon the blood and lymph circulation and on the action of nerve force, why not mechanically use the surgical science in setting right these abnormal conditions?

Here lies the secret of osteopathy – it is the medical-surgical, not the medical and surgical, system. That these structural disorders affect the internal organs of the body cannot be doubted, from the fact that osteopathically, the first fundamental principle of therapeutics is, when diagnosis has revealed such a structural lesion, remove the lesion or correct the displacement, whether of bone, cartilage, ligament or muscle. Following this the second principle is to attend to the general health of the patient by general manipulation of the body tissues, so as to promote free circulation, along with attendance to correct hygienic and dietetic rules. When the disorder has been removed then the blood has free circulation, and the nerve force free channels for action. This pressure upon the nerve fibre or blood vessel may occur at any point in the skeletal structure and the effect may be either direct or reflex; in the former case the effects may be expected near to the point of impingement; in the latter case they will likely be found at a distant part of the body or in distant organs affected reflexly. This is one reason why the spine and the ribs represent in osteopathy the most important parts of the skeleton, because lesions among the vertebrae or ribs affect very seriously those organic centres in the spinal cord, the medulla and the brain at the basis of life, and involve interference with the action of those trophic influences that pass from the spine to the sympathetic ganglia and nerves that supply functional activity to the organs of the thoracic and abdominal regions. Osteopathy aims to correct rib or vertebral displacements, to correct tissue contracture or displacement so that when the tissues and bones are restored to their normal position and function

nature may resume its normal activity. In the removing of these obstructions, irritations and hindrances to free activity lies the great secret of osteopathic success.

Osteopathy is based on accurate knowledge of the anatomical structure and physiological functions of the body organism. Nature has placed within the body certain vital forces, vitalized fluids and vitalizing processes, and activities which in harmonious accord with one another, maintain the normal equilibrium of the body mechanism; any disturbance of these forces, fluids or processes and any interference with their activity, circulation or distribution involves the absence of harmony and interference with the body order. Osteopathic manipulations aim to restore these to their normal condition, so that the body may regain its normal functional equilibrium and form. In this way osteopathy claims that life is revitalized and strengthened by vital forces, vitalizing fluids and processes, disease being removed or overborne by getting rid of an abnormal structural alignment that produces disharmony in the body and prevents normal functional activity.

Technically, osteopathy represents that branch of the science of medicine in diagnosis and therapeutics which is built upon an exact and comprehensive knowledge of the structure of the human body, of its chemical basis and the chemical constitution of its fluids and secretions; of the physical and physiological principles that regulate the body activities, of movement, locomotion, nutrition, vasculature, respiration, muscle, nerve and glandular action; in the elaborate synthesis within the organism of those vital principles at the basis of organic life, so that any deviation from the normal in the form of misplacement, derangement or inco-ordination may be easily discovered and scientifically restored by mechanical operation.

It starts with the assumption that the body is a perfect mechanism, consisting of many parts, essentially of two that we call body and mind, the active and harmonious operation of all the parts in the perfect mechanism constituting health. This perfect mechanism represents the sum as well as the climax of all being, so that every lower organism or form of existence is subservient to and in the main contributory to the upbuilding and development of this masterpiece of nature and God. A healthy body consists of the proper play and correct relation of all the integral parts of the organism, including the correct articulation of the entire skeleton, the proper relations of the muscles, ligaments, cartilages and tendons to one another, and to their skeletal attachments, the exact anatomical

structure and physiological action of the blood vessels and the nerves of the body organism, so that all of these in interdependence upon one another and in correlation to the organism as a whole form the basis of the vital force of the body.

We hold that there is a trophic influence originating in connection with the cerebro-spinal fluid secreted in the brain, emanating from the brain along the spinal canal and the pathways of all the cranial nerves to be distributed in every part of the organism peripherally, so that when the trophic influence reaches the different organs and tissues of the body it is capable of selecting appropriate nutriment from the blood and in conjunction with vitalized nerve force applying them to the nutrition of the local parts. This cerebro-spinal fluid also exerts a lubricating and antiseptic influence upon the nerve tissue and the other body tissues in which it is distributed, that renders those parts normally immune to diseases and when subject to disease is restorative to the normal. In the blood-forming glands of the body we find the basis of a blood formation that is adapted to the body as a whole and its local parts so that the blood carries with it the nutrient matters and oxygen suitable to every organ and tissue of the body. When the proper nerve force is exerted this suitable substance is selected and by a secretory process is separated from the blood to be applied locally to the different tissues of the body. In these trophic, selective and secretory processes lies the secret of healthy blood, well nourished tissue and active metabolism of the tissues which forms the true basis of a healthy body. When the muscles of the body are kept in proper tone, when the skeleton and its attachments are kept free from abnormalities when the cerebro-spinal, cranial and sympathetic nervous systems are kept in free trophic and nutritive operation, when the supply of blood and lymph throughout the body is preserved in normal equilibrium, then the body is healthy. Any obstruction, interference or mal-alignment will produce an unhealthy condition of the organism, because of an interruption of the physiological processes or an interference of some kind with the physiological supplies that are necessary to the nutriment of every local part.

The essential basis of any therapeutic effect upon the body organism, whether produced by drugs as in the old school of medicine, or by mechanical, thermal or electrical stimulation as in the case of the new school of medicine, is that the effect must be produced through a nutritive channel or by nutritive processes. Disease in other words involves malnutrition. The two main physiological functions controlling the nutritive processes are (1) the nervous supply, and (2) the vascular supply.

Both of these must be made the channels of stimulation in order to produce effects upon the organism, otherwise an imperfect result is gained. Here lies the special value of the newer method of mechanical stimulation over the older method of drug stimulation. Chemical stimulation draws forth energy without supplying a new stock of energy, if the chemical stimulation takes place on an inorganic basis, that is by the use of drugs; if it takes place on an organic basis then the chemical organic substances are food, and as such supply materials for the nutritive processes. Stimulation on a mechanical basis has not only a stimulating effect but also a replenishing effect, nerve stimulation and blood stimulation furnishing materials in nutrient matters and nerve force for new energy.

Any manipulative effect to be physiological must be nutritive in its basis. To accomplish this there must be the balance of the nerve force, represented either by the cerebro-spinal system, or the sympathetic system, and the blood. This may be illustrated in connection with the production of an effect upon the heart. In affecting the heart we can reach its activity through two channels in the two systems: (1) in the cerebro-spinal system through the pneumogastric, a direct reflex being established with the heart through the inhibitory function of the pneumogastric, and also through the depressor nerve, an indirect result being established through the vasomotor system in the peripheral parts of the body in connection with the blood supply. In the former case we have an effect through the continuously acting vagus action and in the latter case through the emergency function of the depressor nerve modifying blood pressure so as to relieve the heart when in a condition of strain. (2) In the sympathetic system through the cervical sympathetic, a direct reflex being established by way of the pneumogastric, and also through the splanchnics an indirect result being attained through the vasomotor effect on the peripheral blood supply. This is simply an illustration of what may be stated of every part of the body that the nutrition, rhythm and functional activity are carried on from two standpoints, that of direct nerve force and indirect nerve force through the blood supply, the meeting of these two under normal conditions producing trophicity, tonicity and functional activity. Both nerve force and blood supply are, therefore, under the control of manipulative operations of a mechanical nature and here is the basis of our treatment of diseases operatively. Tonicity, for example, depends upon rhythm and rhythm depends upon the antagonism of opposing elements or factors in the tissue vitality, such as the cerebro-spinal and sympathetic systems, or the nervous system and the blood, or the two kinds of muscle as in the cardiac tissue

substance. The tonic condition of any tissue of the body depends upon these opposing elements meeting in the tissue substance and keeping up the struggle for existence in these tissues of the body. Mechanical therapeutics, therefore, is based upon these physical and physiological principles which are capable of stimulating the vibratory, molecular, electrical and chemical changes that take place in connection with the two main elements of vitalized tissue, the nerve force and the materials of the blood distributed under nerve direction in connection with the selecting power of the trophic system. The stimulation of these processes can be accomplished most physiologically, without any foreign inorganic substances by mechanical manipulation.

The body is not only a perfect mechanism; it is also the most wonderful chemical laboratory that exists anywhere in the universe. In this laboratory are generated acids, alkalis and all the fluids necessary to wash away accumulations of waste or impurity. Every day and every moment of our lives the most wonderful chemical results, analytical and synthetic, are taking place and these form the basis of those normal changes that keep the body in a condition of order. When these substances thus formed are distributed by the channels of the blood and lymph under the direction of the nerve force to all the parts of the body, we have the secret of life. The vital powers of the body are capable of dissolving all the constituent elements of the body from the blood to bone, and the functional action of the body and its parts is capable of modifying nerve, muscle, ligament and bone. If a quantity of blood is thrown out by means of a rupture, the result is a tumourous condition, resulting in the temporary suspension of vital activity. Such deposits are capable of being removed by nature. There are such solvents within the body on an acid and alkaline basis capable of disintegrating the most solid formation of the body, osseous or fibrous. In the body chemical laboratory this continual process of compounding, reducing, and forming substances of all chemical varieties is going on, capable of dissolving the most solid substances so as to prepare the way for the upbuilding processes.

In this renovation process the first essential condition is to rectify any misplacement of the osseous, muscular or ligamentous parts of the body that may be interfering with the nerve, blood and lymph activity, not only to give free space and action to the nerves and blood vessels in communicating the elements of life and activity; but also by a free supply of lymph to wash out the impurities, cleansing the congested parts, so as to prepare for the renovation processes. If the lymph is thrown into a space

where blood has been held in congestion, the blackness of the local part will soon disappear and by absorption there will be a removal of the substances causing the congestion. Hence in the manipulation of the bones, muscles, etc., the object is primarily to give free play to the circulating fluids, with the object of dissolving and removing waste matters, if such are present; secondarily, to furnish a free supply of those substances that are borne upon and in the fluids, especially of an albuminous nature, that are necessary for the renewal of depleted or degenerated parts. In addition to this, the scientific manipulations are designed even where no marked abnormal condition of bone, muscle or ligament is noticeable to throw in the chemical supplies of the body life where they are demanded, so that nature may be assisted in the renovation by being furnished with such substances as are necessary in these processes.

The osteopathic theory is essentially based on the idea that this process is twofold and that it takes place naturally without any foreign drug medication: (1) the stimulation of the production or compounding of the substances that are needed by the body or by its parts; and (2) the manipulation of the parts of the body in such a way that these substances thus prepared by nature may be brought to the parts demanding them most so as to remove all hindrances to health and supply all that is necessary to normal vitality. For example, when we find renal or bladder disorders there is usually found clinically some tenderness in the renal area around the spine. This leads to an exploration of this area to find out any abnormal variations, involving disturbances or displacement in the renal nerves, or else something in the spinal articulation involving pressure or interference with the trophicity of the organs.

It is universally recognised that the lesions in cases of ataxia are not caused by a primary sclerosis of the neuroglia, the degeneration beginning in the prolongations of the posterior nerve roots in the spinal cord. According to the commonly accepted theory the degeneration is due to the cutting off of the nutritive action of the posterior ganglion by some pressure on the nerve fibres at the point of entrance into the spinal cord. Under normal conditions these fibres are constricted at this point of entrance, and it is easy to see how an obstruction like a meningeal thickening and induration, involving vascularity and nutrition, at this local point would result in the degeneration of the intra-spinal fibres. Manipulation in this case would be designed to remove the local pressure and restore the nutritive continuity of the nerve fibres in the spinal cord.

What is true of one small part of the body may be true of the body as a whole, all the different parts of the body being united in the most sympathetic relations. Every organ and every part of the body seems to be at least sub-conscious that it forms a part of a mighty whole. If any part should fail, it is the law of animal life, that all the parts suffer together, because from the great brain source of conscious and sub-conscious power to the minutest nerve filament in the most distant part of the body there is an inseparable relation of structure, function and vital activity, forming the mainspring of life. Man cannot be in perfect health if the minutest nerve fibre to an eyelid is subjected to irritation. The same law holds good of every part of the body. Hence whenever and wherever these minutest variations from the normal are found there is disease in its true and substantial etiology; and there is found a fertile source of malnutrition, irritation and degeneration that produce so many of the symptoms of a pathological condition.

On this basis the osteopathic diagnosis is reduced to the discovery or attempted discovery of the cause or causes of a disease. Diagnostic conditions may be summarized under three heads: (1) misplacement of bone, cartilage, ligament, muscle, membrane or organ of the body; (2) disturbances in the fluids of the organism, including the blood, the lymph and other secretions of the body; and (3) disorders or derangements by tension, impingement, thickening induration, etc., of the nervous system, including its centres, ganglia, plexuses and fibres. Following up this line of physiological thought the osteopathic therapeutics is simplified and will consist of the correction or the removal of the causes or cause of disease.

Corresponding with the diagnostic points, we find: (1) scientific manipulations that aim to correct displacements in the bony and other tissue structures of the body, in its membranes or organs; (2) scientific manipulations that are designed to rectify the disturbances in the circulation of the body fluids and to restore them to their normal condition, especially blood conditions and defects in the blood circulation and distribution; and (3) scientific manipulations that utilize the nervous system with its fibres, ganglia and centres with the view of correcting the nervous disorders, toning up the general system or its local parts, promoting trophic conditions of the nerves and muscles and stimulating a normal correlation of the psychic with the physiological and vegetative functions of the human system.

The entire body is for functional activity; hence there is nothing waste or superfluous and no room in the body for any abnormal condition. Hence the slightest deviation from the normal structure involves some interference with organic action and may give rise to untold mischief in the neural or muscular systems. Theoretically, osteopathy has for its ideal a body whose bone framework is perfectly fitted and delicately set, whose muscles are carefully attached in their origin and insertion, whose blood is freely circulated in every part of every organ and tissue and whose nerve force is the assimilating and life-giving principle in the entire body. There is a physiological sympathy between all the different parts of the body and this sympathy is based upon nerve force. The laws of neural energy furnish the principles on which this uninterrupted sympathy may be preserved and at the same time they explain all possible deviations from the health standard. In harmony with these laws order must be restored to the system.

The basic principle is that if the body organism is in perfect health, every body tissue and structure performs its part without interruption, the body structure representing the framework upon which the other tissues of the body are built and to which they are attached. Hence the bone framework is used in establishing landmarks for physical examination and as a means of restoring misplaced parts of the body. The bones become the basis for operative manipulation, so that manipulation represents the medium of the therapeutic operation in removing pressure, in producing stimulation and inhibition in connection with the nerves and their centres. One of its fundamental principles is that for the body, whether in health or sickness, no extraneous medication is necessary, outside of that natural dieting suggested by experience as essential for the sustenance as well as the repair of existing tissues and for the creation of new tissue in connection with the general disintegration and dissolution of the body bioplasm. Dietetics represents the essential nutritive basis of a healthy and vigorous system. Good food in sufficient quantity, not to excess, and sufficiently varied, together with muscular exercise and normal respiration represent the true culinary and gymnastic theories.

The essential principles of osteopathy may be set down thus: (1) health is natural, disease and death between the time of birth and old age are unnatural; (2) all bodily disorders are the result of mechanical obstruction to free circulation of the vital fluids and forces, and the continuity of nerve force; (3) the impediments in the way of free fluid circulation and uninterrupted nerve force are found in osseous displacements, contracted muscles, ruptured ligaments, constricted or dilated vessels, hypertrophied

tissue substance, or congested conditions of the tissues; (4) these abnormal conditions represent not only the change in structure or function on the part of particular portions of the organism, but also produce physiological disorganization of the vital forces of the body, producing an irritable condition either of over-stimulation, under-stimulation or inhibition resulting in excessive activity, partial activity or inactivity of the vital forces and processes; (5) in the restoration to the normal the main purpose in operative manipulation is to co-ordinate the vital forces, to restore harmony in the vital functions and thus aid nature in the elimination and checking of diseased conditions. In diagnosis based upon accurate knowledge of the structure and functions and activities of the tissues and organs of the body the condition of disturbance is traced to its primary cause through or by the aid of symptoms and secondary conditions; in the organic regional areas of the spinal cord, in the regional plexuses and sympathetic ganglia secondary organic centres are localized in dependence upon the great primary centres of vitality and vital force in the brain, the manipulation aiming at reaching those centres of organic activity, trophic action and regional control that are affected by the disharmony of function, the modification of structure and the disorganization of the vital forces to restore them to normal activity.

Osteopathic manipulation has passed beyond the experimental stage. It is now a demonstrated system of healing. It gains results because it uses and aids nature. All nature is pregnant with force and nature's force is the most remedial because it is natural. The powers of the body are all self-restorative to such an extent that what is necessary is not massage or drug medication or any kind of artificial treatment, but simply the utilization of what lies hidden in the laboratory of life. In this way and on this basis assimilation is possible without alienation, so that remedial measures can be adopted that are native to the organism, with the subtle force of vitality and without any of the harmful properties of foreign substances. The name osteopathy was applied to the new science on account of the fact that the displacement of bones occupied the first place in the category of causes or lesions producing diseased conditions. Like every other name given to a new science it does not cover all that the new science embraces, but simply indicates the germinal point from which the new science started as a science of diagnosis and therapy, as well as an art of diagnosis and therapy. The underlying factor is that of body order and physics developed in connection with animal mechanics. Orthopaedic surgery and orthopraxy have emphasized the mechanical principles in the

treatment of deformities, debilities and deficiencies of the human body. Massage has also emphasized the mechanical method of general rubbing and kneading. Osteopathy attempts to specialize the mechanical principle in dealing with all kinds of curable diseases acute as well as chronic, graduating pressure, tension, vibration and all the mechanical forms of physical stimulation in its application to muscles, bones, blood vessels, nerves and organs of the body so as to gain therapeutic effects. This is the technique of osteopathy. For example, spinal irregularities involving curvatures or separations of the vertebrae throw out of line the vertebral spinous processes and produce impingement upon the nerves as they emerge from the spinal cord. In removing these irregularities mechanically by manipulation the nerve force is liberated from pressure and thus the suffering part of the body supplied by these nerves is relieved by relieving the osseous irregularity. The anatomical order of the body is also dependent upon the osseous framework so that in the adjustment of the framework the body tension producing body pain is relieved and this relief is brought to the system by using the bones as mechanical appliances to remove tension and to produce the stimulation necessary to the stimulation or inhibition of the nerve centres.

Osteopathy repudiates drugs as foreign to the organism. The attempt to furnish an inorganic something to an organic being is regarded, not only as unnecessary, but as actually harmful to the organism. This arises from the fact that nature has provided a well-stored laboratory within the organism itself, consisting of processes, forces, functions, structural and physiological relations as well as organic chemical compounds which are sufficient to meet all probable causes of disease.

For example, in chlorotic anaemia it is a well recognized fact that the disease is not produced by an under supply of iron but from physiological inability to utilize the amount of iron stored in the liver and thrown off in the form of waste matter. Osler says, "iron is present in the faeces of chlorotic patients before they are placed upon any treatment, so that the disease does not result from any deficiency of available iron in the food". To remedy this condition the administration of inorganic iron is not only superfluous but injurious, because it will increase the amount of waste thrown off through the excretory system and therefore increase the secretory function to an excessive degree. Bunge claims that sulphur prevents the assimilation of this organic iron found in the food, the sulphides produced by fermentation retarding the assimilation. The administration of inorganic iron is said to promote a combination of the

sulphides with this iron so as to permit the normal-organic iron to combine with the haemoglobin substance. This is simply a theory and it lacks demonstration. Clinical experience has demonstrated that the correct way to remedy the condition in which the iron is not used by the system but thrown off as waste is to remedy the defective nutritive condition. This can be done, not by increasing the amount of inorganic iron, but by promoting those physiological processes that are necessary to blood formation in connection with the assimilation of iron in organic form to the newly formed or combined haemoglobin of the red blood corpuscles, thereby preventing the iron that is accumulating in the system from being wasted. In the case with the vasomotor system and the temperature nervous system of centres and nerves it is possible to reduce the febrile temperature and keep it within bounds, use being made of the nerve force and the blood supply through vasomotion. More particularly through the vasomotor system it is possible to keep up the circulation of fresh and nutritious blood so as to check the ravages of the micro-organic germs to such an extent as to promote phagocytosis by stimulating the white blood corpuscles to activity in the destruction of the micro-organisms that are rendered lethargic by the febrile temperature and the free supply of fresh blood, or by the production of chemical compounds that destroy the germs. This renders unnecessary the injection of serum on the basis of modern serum-therapy, because by the manipulation of the blood and lymph in connection with the nervous system in the individual affected, the leucocytes can be stimulated to such activity as to eat up the germs and thereby produce in the system a serum that will render the body immune from the action of these disease germs. In pulmonary affections it may be demonstrated that tuberculosis is a disease at least associated with the nervous system, the normal trophic influences being cut off in some way from the pulmonary system, so that the pulmonary system becomes a prey to the devastating action of the germs of tuberculosis. Hence the contracted thoracic conditions so often associated with phthisis or the vagus interference found in connection with the vertebral displacements, or pressure upon the vagus in the upper thoracic region.

The lungs represent the seat of many forms of pulmonary disease that have wrought havoc among humanity. The condition may be one of simple congestion, of bronchial inflammation, or of pneumonic infiltration of the pulmonary substance; all these inflammatory conditions are caused by an interference with the blood flow, dependent on contracted conditions of the muscles of the thorax, the displacement of the ribs, of the induration of

the spinal muscles in the thoracic region of the spine, producing excessive stimulation or inhibition of the pulmonary nerves. These mechanical causes interfere with normal respiratory actions, preventing the inspiration of a sufficient amount of pure oxygen and the expiration of the necessary amount of carbon dioxide, as well as cutting off the trophic influence from the pulmonary tissue. To remove these causes manipulation of the thoracic and spinal muscles is resorted to in order to remove the contracture, the rib depression is rectified, inhibition is brought to bear upon the spinal nerves that branch out from the spinal cord along the upper half of the dorsal region to regulate vasomotor action and stimulate pneumo-gastric action in connection with lung trophicity.

Headache almost invariably involves a pressure upon the cranial nerves, a displaced atlas or axis or vertebral displacement of some kind in the upper cervical region of the cord producing pressure. Asthmatic conditions are usually found in connection with contracted and confined thoracic conditions, interfering with the action and supply of the nervous system to the lungs, and thereby preventing the normal respiratory action which requires the action of muscles and nerves and the thoracic enlargements of the chest produced by the raising, expansion and rotation of the ribs and the rib attachments together with the diaphragm.

Drug therapeutics bases its *materia medica* on pathology, symptomatology, and pharmacology in their relation to chemistry, physics, and physiology. The application of pharmacology is essentially empirical and alien to the system. Osteopathic therapeutics bases its *materia medica* upon the chemical, physical, and vital or physiological functional principles of the normal body organism in comparison with the abnormal functional action of the same principles from a pathological standpoint; so that while health represents normal functional action, disease represents abnormal functional action of the organism. Hence, while drug therapy uses internally or externally inorganic remedies, osteopathic therapy represents applied functional biology and physiology and applied anatomy on the basis of applied mechanical physics and chemistry.

Osteopathy claims a prophylactic as well as a curative value. If osteopathy is correct physiologically, and everything depends on physiological demonstration, then the osteopathic practitioner should be in the best sense a family physician. His place in society is to attend to the family, so that in the nurture of children the skeletal structure and physiological function of the organs of the body may be corrected at every mischance and

kept in a correct condition. A child may be born with a misplaced anatomical structure or perverted physiological functions. In childbirth these misplacements may be produced, and if a child is to survive the operation of birth or to live a happy life in the future these must be attended to in childhood. These childhood conditions account for much of the unhappiness and misery of later years, and give rise to many of the diseases that end in death before adulthood is reached.

Osteopathy lays it down as a necessary principle that health is natural, disease and death unnatural, between childhood and senility. To demonstrate this the osteopath asks a field and a fair and even chance to show that his contention is correct physiologically. He asks the privilege of applying, subject to the law, the principles of physiological medicine. He is not a Christian Scientist, and has nothing akin to the mind healer. He believes in mind as the dominant factor in life, mind representing the master element in connection with the body organism; but he does not believe that in mind healing can be found a panacea for all the ills that afflict humanity. The diseases that affect the body are no ghosts with phantom-like appearance. That they are too real to require a demonstration is evident from the fact that osteopathic symptomatology is based entirely upon structural and functional mal-alignment. Even in the case of mental diseases we find that they are associated with the same or similar anatomical and physiological maladjustments, displacements, or hypertrophic conditions, so that even insanity is subject to correction when these abnormal conditions are removed.

Physiology explains and largely accounts for psychological conditions, for true psychology is founded on physiology. The mental states and activities are of value only as they are illustrations and manifestations of physiological relations and conditions. The psychic conditions of life are brought out in the study and diagnosis of mental diseases and in many of the nervous diseases. The physiology of the brain, the spinal cord, and the entire nervous system is at the foundation of every true theory of life, whether we take it as physical life, in its preservation, prolongation, and its treatment under diseased conditions; or in regard to mental life, normal or abnormal, or even the higher moral and spiritual life. If physiology is taught in all its bearings it gives us the functions of a differentiated human life, consisting of a number of organs, all of which are independent and yet united together to form in unison and harmonious activity a single life. As we step into the higher field of psycho-physiology we find that mind is the ascendant power, and that in a healthy physiological life nothing less

than a healthy mind can secure that vigorous condition of body necessary to health and happiness. While we treat what seem to be purely bodily diseases we must remember that the field of mental diseases is also opened up, and that these mental conditions of unhealth must be removed before the cure of body disease is possible. It is probable that every active operation of the nervous system affects the whole human organism, so that there must be constant activity on the part of the nerve cells, accompanied by continued impulses entering and leaving those cells. This forms the basis of the continuity of conscious experience. Thus to each man is given by birth, not only a body, but also a mind, the basis of mental character and development. When man starts out from this initial point his development is determined largely by environing conditions and educative processes. Even the power of volition is increased by culture, so that the inhibitory influence depends largely on educative influences. These educative influences pass through the nervous system, especially in connection with the education of the central nervous system.

Mental development therefore, for good or ill, for health or disease of mind, depends on those educative influences under the control of physiological nerve tissue. Here lies the basis of osteopathic work in mental diseases. The same, or at least analogous, causes that produce bodily diseases may produce mental diseases by involving an interference with that neural mechanism that is the essential physiological basis of mind and mental activity. Consciousness is not the product of the changes that take place in the cells, because even a knowledge of all the internal changes would not give us consciousness. Some have identified energy of some kind with the causation of consciousness. But energy is a physical attribute in virtue of which certain matter or matters possess the power of acting, this action depending on the active changes taking place in the constituent elements. If we consider the nervous system as consisting of a complexity of nervous mechanisms, each mechanism in its simple form constituting an activity in which there is consciousness, then the entire nervous system would represent a complex series of conscious states from the psychic standpoint. Consciousness must exist, therefore, not only in the case of the entire brain, but in the case of all the cells that constitute the brain. Here lies the basis of memory and recollection, the impulses passing to the nerve cells in the brain where, on account of their strength, they make a vivid impression upon the cells, so that when the stimulation has passed away the impression continues subject to recall. By the constant repetition of these processes the impressions become so closely associated with the cell

body that they form an inherent part of the cell life, so that by heredity these are transmitted from generation to generation, forming the physiological basis of mental intuitions. These intuitions represent modifications of the brain under the influence of mental development in connection with environment, each brain representing its own stage of progress in evolution. Where we have a great number and variety of impressions we find great variation in the cell changes and a corresponding variety in the mental phenomena. When these impressions are so fixed in the brain cells that stimuli from another part of the brain can call forth a response, we have a fully developed mental condition. Mental development implies the receptive condition of the nerve cells and also the active operation of these cells in the changes involved in the molecular development. These are regulated somewhat by the capacity of selection in the case of different impressions by the concentration upon particular impressions to the exclusion of others, by the activity of the cells in connection with particular impressions and the power of associating these impressions. Each of these elements has a physiological basis in the central nervous system, the brain development and mental culture depending largely upon proper nutrition, proper exercise, and correct adjustment of all its parts on the basis of neural stability. Individuals differ from one another in the original structure and constitution of the nervous system, this forming the basis of different degrees of intelligence and psychic initiatives as we find these in different individuals. While thought and mental activity cannot be spoken of as secretions, as Cabanis claimed, thought is impossible and mental activity an absurdity apart from those nervous processes which have their bases in the chemical, physiological, and vital changes taking place in the nerve cells. Here lies the secret of osteopathic treatment by manipulation in the case of mental diseases, the manipulation being directed to the establishment of stability in the trophic conditions, adjusting the normal relations of cell with cell, preserving the integrity and unity of the nervous system, and correcting any misplacements or maladjustments of bone, muscle, etc., that would interfere with neural irritability or conductivity, the blood circulation and other nutritive conditions necessary to neural integrity and continuity. By removing those abnormal processes and conditions that affect the nervous system, the nervous system is set free as the medium for the manifestation of mental activity, and thus sanity may take the place of insanity.

The principle of auto-suggestion is not the principle of osteopathy, although it may undoubtedly be utilized in dealing with purely mental

conditions. Scientific suggestive therapy is undoubtedly a part of osteopathy, as it is of every rational system. But osteopathy recognizes body diseases as well as mental diseases, and it deals with these body diseases from a body or material standpoint. Osteopathic therapy is, therefore, material as well as psychic. Autosuggestion has nothing to do with the therapy of body diseases, because osteopathic treatment can be applied even where there is mental resistance. The *materia medica* is purely physiological and therefore material, without any relation to spiritualism or Christian science in any form. In my own laboratory I have demonstrated that in cardiac conditions of failure or of over-activity it is not necessary to give a drug either to stimulate or lessen the heart action; for by the use of the sphygmograph, either the radial or carotid, or the cardiograph, along with the recording kymograph, we have shown that the moment the fingers are placed upon the pneumogastric nerves the action of the heart is accelerated, and the moment that manipulation is applied to the superior cervical region controlling the sympathetic ganglia and nerves in connection with the heart the action of the heart is lessened. Tracings of some of these experiments have been preserved in the case of both the normal and pathological heart. Diarrhoea and constipation have both been controlled and corrected by the manipulation of the nerves from the spinal cord regulating the secretory and peristaltic processes in the intestines. There seems to be an economy of nature in the capacity of the different nerves for stimulation; for example, the dilator fibres are more easily stimulated than the constrictor fibres in the vasomotor system, the constrictors being the constantly active and the dilators the emergency fibres, the former representing the tendency to normalization in connection with the blood supply. Diarrhoea is produced by some mechanical irritation or obstruction, as, for example, the contracted condition of the spinal muscles, resulting in an irritable condition of the vasomotor splanchnics to the visceral organs. The result is that the mucous lining of the intestines becomes congested or inflammatory, associated with accelerated peristaltic action. The exciting cause from a physiological standpoint is the increased excitability of the vasomotor nerves passing out of the spinal cord along the lower dorsal region. To remove this condition an inhibitory pressure is brought to bear upon the lower dorsal region along the spine so as to modify and normalize the peristalsis of the intestines and to regulate the blood supply, thus establishing nutritive order.

The curative standpoint of osteopathy is Nature's means to health. Health is associated with the harmonious action of all the different parts of

the system, when these parts are free from irritation or disturbance from any cause, so that all the fluids, forces and substances essential to life are permitted to flow freely to every part of the body, uninterrupted by any stoppage, impingement, dislocation, or displacement of any kind. The great law of life is harmony. Disharmony involves disease and leads to death. To remove this disharmony the osteopath attempts to trace out and readjust the mechanical disorders that impede some of the normal functions, thereby enabling nature to return to her equilibrium and to give health to the patient. Most, if not all, diseases have a direct relation to some mechanical cause, and the only cure for such a primary lesion is the mechanical correction of it. Where the condition is complicated, as in many diseases, by the presence of micro-organic germs, we accept the theory of Hueppe, in opposition to the Koch school, that specific diseases are not caused by specific germs. Disease represents a function, not of the germ, but of the animal that is diseased, the normal activity of the organic cells giving health and the abnormal activity of the organic cells giving disease. According to this, disease is the result of abnormal functional activity, resulting from (1) certain external conditions and (2) internal body conditions, including the presence of the bacteria. Among the internal conditions we include the abnormalities already referred to, which result in a malnutritional condition of certain tissues or organs of the body, this malnutritional condition furnishing the field for the bacterial deposit, development and feeding in the tissues. When there is an obstruction to the free fluid circulation and the free nerve current, there is presented a culture field for these germs, which begin to multiply and also to throw off toxic substances.

Osteopathic therapeutics attempts to relieve the mechanical obstruction so as to prevent the germs from enjoying a field of culture, and when cut off from this culture medium throws in a rich supply of fresh blood, whose leucocytes become active in the destruction of the disease germs. Fresh blood, fresh lymph, and fresh cerebro-spinal fluid represent three antiseptics furnished by Nature for the use of the operator in dealing with micro-organisms, as well as forming a nutritive basis in restoring normal local nutrition. All inflammatory conditions represent primarily congestive conditions, dependent on obstruction either of the arterial or venous circulation. The removal of the congestion involves the removal of the mechanical cause of the obstruction to the circulation.

From a diagnostic standpoint, osteopathy aims to develop a new science of diagnosis in addition to the older methods of diagnosis by palpation,

auscultation and percussion. This involves the idea of a refined and sensitive tactition. A complete knowledge of human anatomy, both normal and morbid includes a knowledge of the system from the standpoint of educated touch, so that proper discrimination may be made between the normal and abnormal. The fingers can certainly be delicately educated, to such an extent that in the blind there may be the almost vicarious substitution of touch for vision. The basis of this highly refined tactile education is found in the physiological structure and specialized activity of the minute nerve fibres and neuromuscular organs in the fingers.

At the basis of all the senses lies the essential principle of sensibility, so that in the education of the senses this sensibility may be acutely specialized. From the standpoint of objective diagnosis this educated tactile sensibility presents a new and most important diagnostic means. It represents the materializing principle of osteopathic diagnosis, distinguished from the subjective diagnostic principle of symptomatology. Symptoms are always more or less exaggerated. A physical examination so far excels any subjective statement of the case that facts become the scientific basis of a true diagnosis. Part of the course in osteopathic education is the training in this method of diagnosis by purely physical examination, so that the practitioner may be able to trace out on the normal body the outline of all the organs, the vertebral relations, skeletal articulations, etc. In the spinal cord there are localized subsidiary organic centres, centres of reflex action and subordinate centres, corresponding with the brain primary centres, so that in nervous disorders and diseases of a nervous origin or complication, the operator can reach those centres of vital activity in connection with the vital forces by manipulation along the spine. The object is to manipulate the nerve centre and the nerve fibre as well as to correct any existing lesion, so that by physiological stimulation or inhibition neural harmony, neural trophicity and neural continuity of impulse may be established.

By this tactile diagnosis it is easy to detect an enlarged spleen, a dilated stomach, an impacted colon or a hypertrophied liver. Along the spine the fingers can detect contractures and tender spots that indicate congested conditions around the cord and spinal areas the delicate manipulation of which will remove congestion and restore functional activity to the parts supplied by these nerves. In gynaecology the educated finger is able to appreciate the most exact condition of the affected organs or parts, detecting enlargements, prolapsed conditions, lacerations, ulcerations, hypertrophied and tense or relaxed conditions of the sphincter muscles, sac-

like dilatations accompanying catarrhal inflammation and the lack of tonicity along the walls of the excretory organs.

We cannot but think of that old adage as we look back over the history of medicine, "thinking is the least exerted privilege of cultivated humanity". Man is wedded to the opinions that are born in his being. And yet it is a wise provision, as the progressive spirit marches on, that science demands, first, the proof of the new to a claim upon belief, and secondly, the declaration to mankind of what has been scientifically demonstrated. To be branded as novel does not imply that an idea is false. The blood circulated in the same way long centuries before Harvey explained the philosophy of its circulation. The human body has survived many changeful vicissitudes involving disease, pestilence and death. If today we find that the body is interwoven by a meshwork of nerves, by means of which all the vital forces of the body are governed; if today we find that everywhere in the tissue structures of this body there are two great pathways of fluid circulation, by means of which the blood and lymph are carried to the most remote recesses of the organism, laden with nutrient materials for the nutrition of the tissues and bearing away the waste produced by the nutritional processes - it is not mere speculation to assert that when we know the nerves that direct and control and the vessels that supply with nutriment certain parts of the body, and when we know their functions, that these functions can be controlled more certainly by manipulation of the nerves and vessels than by pouring into the stomach an uncertain quantity and potency of drugs. "Nature has certainly a wonderful power of putting things right in the end."

I have hope that the medical profession will be quick to receive, slow to dispute, on the basis of contradiction to old established customs, methods and theories, the claims of this new child of science. No class of men has been so quick to appropriate the good, and yet no class of men has been so ready to dispute the presentation of a thought or principle tending to overturn or interfere with the theories or dogmas of the profession. This has been largely due to the fact that scholastic jealousy has forced a medical etiquette upon the profession that regards with jealousy anything that appears as the product of a different school. But this old time jealousy and traditional reverence for antiquity is fast dying away. In the growth of science, in the progress of intellectual advancement, in the researches of the laboratory, loyalty to old established customs ceases to be a virtue; and he who delves deep into the mysteries of science realizes that foregone conclusions are unavailing, that truth presents the only open pathway to

discovery and that loyalty to the right and the scientific, whether old or new is the only principle of our modern times worth fighting for. May it be so that when osteopathy is fully unfolded to the scientific world and its principles are scientifically evolved and systematized, it may be quickly grasped and its principles patiently, persistently and clearly unfolded so as to increase the aggregate of human health and happiness. Till then, we who have already perceived and been able to appreciate the value of these principles must continue our researches in the field of human anatomy and physiology, in the clinical and laboratory investigation and practical demonstration, in the hope that every remote recess of the organism may be laid bare in such a way that no one may fail to see how the touch and presence of the educated hand can profoundly affect the entire functional well-being of the body organism.

**EXTRACT FROM A. T. STILL RESEARCH INSTITUTE
BULLETIN NO. 1, AUGUST, 1910**

In his report in August, 1910, Dr. Littlejohn, after describing the preliminary work necessary, said:

“In my previous work I have come to the tentative conclusion that the neoplastic diseases, like tuberculosis, cancer, etc., are all based on toxicosis – the toxic condition involving primarily the blood and the nervous system – localization taking place through injury, hyper-irritation, sub-irritability, and non-use of organs and structure.

“Implantation experiments have been made on animals with a view to determining the toxic development, the tumour cell implantation and its processes. Nothing definite can be reported now.

“Experiments have been made in the attempt to counteract the toxic elements in animal and human bodies. Here the lesion is regarded as toxic, and the toxicity is regarded as an obstruction or irritation. The principle of osteopathic toxicology has been appealed to experimentally to try to eliminate this from the system. Here I wish to note that I am no believer in toxic drugs, or scrums, or vaccines. I believe that the principle of anti-toxin is right, but that its method is wrong. I have been able to demonstrate, like others in the medical field, that many human organisms are susceptible to serums or other products taken from or attenuated through animal lymph or blood. This is in line with the physiological truth that the blood, fluids and tissues of the body are manufactured and formed within the organisms in which these are found, and only through the food channels can foreign materials be brought into the human organism.

“Therefore, I exorcise from the field of osteopathic toxicology all elements foreign to the proximate principles of the human body. Based on this negative conclusion, I look to the field of physical therapeutics to supply the toxicologic means. My principle is to eliminate the toxic elements already present, because that is the basis of toxicity and bacterial development. All forms of vaccine therapy by bacterial products are excluded, because there is the toxic stimulation of some organ or group of organs to some functional activity as a therapeutic means. This is physiologically unscientific.

“The principle of attenuation used in anti-toxic preparation is a physical process, and this is used in the preparation of an antidote, but instead of

the medium of a horse or other animal serum being used, distilled water, aqua pura, is used as the medium, and alcohol is used as the preservative when this is necessary.

“This principle separates at once our experiments absolutely from the vaccine theories of the medical profession, and gives us a basic principle in the physical therapeutics peculiar to osteopathy. The correction of lesions, mechanical, chemical, and toxic, is our fundamental groundwork in this experimentation.

“Our primary proposition based upon experiments is, that within the organism, mechanically, chemically, biologically there is a continuous physiological effort to maintain the standard of normality in the body.

“Secondary to this, we find attempts to vary from this standard, mechanically, chemically, and biologically. To meet these, there is the ruling principle of therapeutics, that of adjustment, based on the practical technique of correction. In the mechanical, chemical, and biological fields this principle must be elaborated – mechanically by manipulative treatment and surgery where necessary; chemically and biologically by chemical and physical toxicology and by diet.”

SPINAL TECHNIQUE

Dr. Littlejohn read a paper before the Chicago Osteopathic Society in April 1910 on “Spinal Technique,” which will be published in full in the Journal of the American Osteopathic Association, from which the following excerpts are taken. The paper is very elaborate and goes into minute details. The quotations below make clear Dr. Littlejohn’s basic principle of osteopathy, his general method of procedure, and the application in pelvic disturbances, including neoplastic growths. His lectures on “Toxins” will be published within a few months. They will make clear the toxic influence in neoplastic diseases:

“Spinal technique is based on physiological physics. There is no pure mechanics in the body. The idea of the body as a machine or mechanism has been run to the ground. The body as a body is alive. The body alive that we deal with is the organism in which the structural units or parts are united in vital relationships, in such a way that the organism executes its vital activities as functional expressions of life, and each structural unit has a part to play in the vital processes.

“This means that physiological physics or biological mechanics underlie all operations of the organism, and every abnormal condition of structure or activity has an underlying physiological-physical problem. There is no purely mechanical lesion, as there can be no purely mechanical condition of the organism. Even a fracture does not present the purely mechanical factor, much less a dislocation. Every lesion is based on modified articular relation. The lesion, then, is not in the position, or rather malposition, but in the mal-relation of these structures, or the mal-activity of the organism. Each unit part of the organism is correlated to each other unit part, and these relations are established by means of articulations. Here we find the basic foundation of the lesion theory of osteopathy.

“What is a lesion ? Briefly, any change from the normal in structural relations, activity correlations, or environing conditions that reacts upon the organism or its functionings sufficiently to produce vital unhealth.

“This emphasizes the idea that adjustment is the principle of therapy. The body organism is an adjusted piece of living machinery, mobile in all its structures, articulated in all its structural relationships. The essential factor of life in the organism is mobility. Lessen this mobility and you sow the seeds of death.

“What does this signify? That the foundation of the osteopathic lesion is not, or at least not exclusively to be traced to, pressure or obstruction of structures upon nerves or blood vessels. We must get back to this, because no purely mechanical condition can exist in the living organism.

“First – There is a physiological perversion of the tissues themselves, muscles, bones, ligaments, fascia, interfering with the nerve activity; and this represents disturbed articulation mobility. This makes the muscles, fascia and ligaments the initial disturbers.

“Second – Following up the irritation of the afferent nerves, we find mechanical disturbance of innervation, resulting in the contracture of muscle, hardening of fascia, thickening of cartilage, etc.

“Third – The net resultant of such nerve irritation is a reaction upon physiological functionings, with a special disturbance of vaso-motion and consequent circulatory changes. The vaso-motor disturbances are the key to the pathology, because vaso-motion is the balance wheel and controller of physiological circulation; and whenever the circulation becomes unphysiologic (i.e. pathology, because pathology is simply perverted physiology), the disturbance must be of a vaso-motor order. The principal

changes are those of modified constriction or dilation with anaemia (starvation) or hyperaemia (congestion). Interference with the blood stream causes the localized nutritive disturbances in the ganglionic centres, impairing the nerve functioning and changing the structure of the neurones. Perversion thus underlies all the morbid changes.

“With the view of bringing out these points, I have gone into the field of research physiological, physical, and toxic. These experiments were begun twelve years ago on dogs, and have been continued specially during the last eight years on dogs, cats, guinea pigs and chickens. We have dissected and examined carefully a number of chickens and dogs that have died from various causes as well as those that have been artificially operated upon with the view of producing the mal-relation lesion. In addition we have injected the tubercular toxin, diphtheric toxin, and various forms of germs. The most typical results in the latter field have been toxic degeneration of the pneumogastric nerve, of the solar plexus, and sections of the spinal cord. In confirmation of these, the dissections of the human cadaver in well authenticated cases of tuberculosis have brought out the pneumogastric atrophy and degeneration.

“In the production of the lesions in the rib and vertebra fields we have followed two methods: (1) To bind the animal to the ground either on the back or belly, using a device like the pitchfork. Then we produce the lesion by extension, traction and torsion, as in correction. In this case the animal is not anaesthetized; (2) We have used anaesthesia, both chloroform and electric anaesthetization, especially in the cervical region. Following this (a) we watch the animal closely for pain symptoms, local inflammation, muscle rigidity; (b) we investigate the excretions for evidences of organic disturbances; (c) in some of the cases we have corrected the trial adjustments and watched the results; (d) in a few we have allowed the traumatic conditions to persist so as to notice chronic reactions; and (e) in a few we have made complete dissections, examining the organs, the muscles, ligaments, and nerve fibres and cells.

“The conclusions, as before stated, may be here enforced: (a) There is no evidence of mechanical pressure as the lesion condition: (b) in one case of traumatic lesion, persisting for several months, unbalanced nutrition, bilateral atrophy in the spinous muscles along the two sides of the spine was apparent: (c) the typical lesion condition is found in the articular field of the ligaments – the capsular and articulating ligamentous structures exhibiting the various degrees of tension corresponding with the lesion:

(d) haemorrhagic points in a muscle corresponding with rupture, haemorrhages in the meningeal field, congestive stasis of blood vessel segments, and extravasation in the spinal cord cell sections represent the pathology of the blood. These all correspond as we stated, with vaso-motor changes, the vaso-motor condition being the key to circulation in its balanced condition as well as the stimulus to visceromotor activities: (e) the use of strychnine for some time previous to the production of lesion seemed to cause in two cases a more serious condition – a more rapid reaction along the line of contracture, greater rigidity and extensive hyperaemia.

“As the sacro-iliac articulations are anatomically weak from the fact that no compensation is provided by nature for their weakening, when the posterior musculature becomes tense or passes into a condition of spasmodic contracture, this does not relieve the tension on the ligaments, fascia, or connective tissue in the sacro-iliac field. The sacro-iliac articulations may be unduly relaxed. In this case the posterior musculature must do more work in the attempt to maintain the normal erect posture. This explains the necessity of recumbency in so many gynaecological cases and also in the pregnant condition. The abnormal tension on the ligament field of the sacro-iliac articulation depends largely, if not altogether, on overstrain, and this explains the functional disturbances so frequently found in this sacro-iliac articulation field without modified mobility in the articulation due to iliac displacement.

“Lateral curvatures of the spine or lateral lesions in the articulation field of certain of the vertebrae, such as the fourth and fifth dorsal, the eighth, ninth and tenth dorsal, the second and third lumbar, the fifth cervical and the sacrum, represent causes of back strain, and frequently explain the shortness of one limb, without any limb, hip or pelvic lesion. Such lateral abnormalities lay the foundation for a one-sided pain, such as we frequently find in the gynaecological field. In these cases the original disturbance may be, (1) in the soft tissues of the sacro-iliac field, (2) in the posterior musculature, or (3) in the articular field of the particular vertebrae, especially at the centre of the arches – that is, fourth and fifth dorsal and second and third lumbar, or at the junction point of the arches, ninth dorsal and fifth lumbar.

“As a basis for treatment it is important to determine whether the primary cause is, (1) intra-pelvic or intra-abdominal, or (2) rigid articulation in the spinal field, or (3) a combination of both.

“In the treatment of type (1) we find that the intra-pelvic cause may be associated with congestive enlargement of the organs or neoplastic growths. Here the posture is modified from normal to compensate for or diminish the pressure conditions in the pelvic cavity. Here we find the explanation of a condition that is found always in pelvic tumours, viz: the enlargement and hardening of the posterior musculature, with an abnormal increase of fascia in the field of the lumbo-sacral region. In my opinion, however, the prolapsus of organs, the ptosis accompanying congestion of organs and many of the tumour developments, are secondary to the abnormal conditions in the articulation fields of the spine. In these cases I do not consider the replacement of the organs as the appropriate treatment, because prolapsed ovaries, retroverted uterus, rigid round ligaments, tense utero-sacral ligaments are, in the majority of cases, secondary reactions to the spinal lesion field. In the inflammatory and congestive conditions of the abdominal and pelvic organs the attitude of the body is modified to prevent pressure or jar in the visceral field, resulting in the rigid spinal posture. In these cases the spinous muscles are either in a state of excited irritability or spasmodic contracture so that in this case inhibition to soothe the irritation and traction or extension with articulation in the spinal field to overcome the tenesmus of the muscles and ligaments will give the best results.

“The field of gynaecology lies very largely in this type of condition. I believe that too much has been done in the way of localized treatments in this class of cases. We must remember that the pelvic field is physiologically defective in vaso-motion, like the brain, the lungs, and the kidney fields; and that the only way in which we can reach the congestions and inflammations, whether acute or in the neoplasms, is to deal with the congestion as a disturbed condition of the general blood supply of the body, and use the corrected condition of the spinal field, with the corrected postural conditions in connection with articulation, as the means of rectifying the pelvic disturbances. If we can correct the spinal strain, establish mobility versus static conditions of the entire spinal structural field, in fact, establish corrected skeletal adjustment, no local measures will be necessary to correct conditions.”

THE BASIC PRINCIPLES OF OSTEOPATHY

J. MARTIN LITTLEJOHN

The underlying principle of osteopathy is expressed in the words, Mechanical Organic Adjustment. What is Osteopathy? If the principle of osteopathy is, as we have said, the principle of adjustment applied as a universal law, then we will define osteopathy something like this: *Osteopathy is a system or science of healing that uses the natural resources of the body in the corrective field for the adjustment of structural conditions, to stimulate the proper preparation and distribution of the fluids and forces of the body and to promote co-operation and harmony inside the body as a mechanism.* According to this the body is a mechanism; that is, it is an order of machine, all the parts of the machine working together for the common good of the mechanism. In addition to this, the body is its own commissariat; in other words it takes the raw materials from the field of nature, and it uses these basic substances in the preparation of new substances and in the preparation of forces. The body is a vital mechanism – that is an organism. Now this is the part we must not forget. It is not correct to speak of the body as a machine, or as a mechanism, unless we speak of it as a vital mechanism. When the body takes the raw materials it transforms these into the vital. There is nothing that is assimilated in the body that is not first vitalized, and every process which takes place in the body is a vital process. Every lesion that we find in the body is a vital lesion in relation to the vitality of the patient. For example, if the bone lesion were the only lesion found in the body, then after correction it would remain corrected. Does it in fact always do so? It gets out because the vitality will not allow it to remain correct.

When the tissues are abnormal, or when the body is depleted, upbuilding takes place from within. When, for example, the blood is changed, respirations take place by the conjoined action of forces. When a febrile action takes place, the nervous system alone can step in and correct. If the heart is overworked it does not do any good to give anything in the way of a substance to inhibit or depress. The only way to depress the heart is through the cardiac nerve mechanism and by counterbalancing in that mechanism whatever is overworking the heart.

This conception of the body as a vital mechanism implies that every part of the organism is supplied with circulating blood and nerve force. These are the two balancing functions in the body which are used as corrective means in osteopathic treatment. If the body is a mechanism, a commissariat

and an organism, the next question is, “What is Health?” and “What is Disease?” Health implies perfect structural adjustment. This includes bones, muscles, ligaments, blood vessels and so on, which are the media through which vital relations are expressed. Health also implies adjustment of activity on the basis of nerve force, that is the mind. It implies adjustment of the organism to its environment. In contrast with health we have “unhealth”. This means the absence of the three conditions of health, or some change in them. Health does not contrast with disease; health contrasts with “unhealth”, and disease is something entirely different. Disease is a condition of “unhealth” in which we find a result or results of some interference with, or obstruction to, the three conditions of health. It may be the effect of an anatomical condition, such as a lesion of bone, muscle or ligament; it may be the effect of physiological disharmony produced by improper forms of diet; it may be the result of some environmental condition acting as an exciting or depressing cause.

In the adjusted organism the basis of the vital functions in the body is the blood circulation and the nerve force action, blood being regarded as including both blood and lymph. Blood and lymph have a definite physiological composition which depends for replenishment on the process of nutrition. In addition to this the blood circulates through a regular system of tubes with definite vessel paths which are regulated by definite laws of physics which may be termed “physiological physics”. The body also has a regular sewerage system. The wastes which are formed in the body and by the body require to be eliminated and the large majority of the diseases which we commonly find can be regarded as being concerned with “sewerage”. Practically all of the febrile diseases, for example, are diseases of elimination, and eruptions, rashes, etc, are expressions of attempted elimination. In addition to the blood circulation we have the nerve forces which originate in the ganglion cells, pass out along the nerve fibres and furnish stimuli to the activity and nutrition of the body. The nerve energy is dependent upon the blood and the blood is dependent upon the nerve energy. Healthy tissue is tissue in which the blood circulation and the nerve force are correlated. This is why practically all pathological conditions are associated with interference or obstructions to nerve and blood supply. This is the foundation of the lesion. A lesion is something which interferes with the free circulation of the blood as a fluid and nerve energy as a force. It is this interference which is associated with the abnormal condition or position of tissues such as bones, muscles and ligaments. The thickening and hardening of muscles or ligaments is the most common lesion

producing obstruction. The same condition of hardening or thickening of soft tissues may be found anywhere over the surface of the body. These then, are the lesions which we find; misplacement of structure, hardening or thickening of soft tissues, alteration in the relation of one structure to another and change in the condition of the cells.

The question now arises, What has produced these lesions? The first place should probably be given to the strains, sprains, falls, etc, common in childhood and youth. Secondly, there is the tension and strain produced by physical work. This includes accidents to the body tissues in connection with posture, change of posture, sitting, walking, lying, etc. The result is imbalance of certain portions of the body. At first slight deviations in tissues are produced, but these later develop into marked lesions. Thirdly, exposure to changes in atmosphere and climate can unite with other factors in producing hardening, thickening, contraction and relaxation of the muscles and ligaments, and if this state of affairs continues movements of bones may result and bring about an alteration of structural relationships.

Lesions and changes in structural relationships, how ever caused, lead to blood vessels and nerves becoming irritated and subjected to varying degrees of obstruction. The obstruction or pressure affects the blood circulation in the spinal cord and this in turn leads to an altered distribution of the nerve supply to organs and inequality in the distribution of blood with stagnation of the blood in particular areas and exaggeration of nerve energy and excessive activity in particular organs. The obstructive conditions which we find always involve the nerve and blood supply which means that every lesion irritates or upsets the blood and nerve distribution; obstruction is the first or primary thing and the result of the obstruction is disease when it localizes itself in some particular part of the body. The irritation which we commonly call the lesion may be due to (a) contracture, hardening, thickening or undue softening of the soft tissues, including muscles, fascia and cartilage, or (b) slight changes in the relations of the hard tissues such as bones, ligaments and tendons and including articular changes and luxations, or (c) modification of some kind in the environment. It must be noted that environment is as essential as structure because it represents stimuli and is in fact the stimulus to the normal activity of the blood and of nerve force.

One or more of these three fundamental factors are always found as the cause of inco-ordination in the mechanism of the body. For example, where we find a condition of hardening or contracture in the surface tissues

the result is a state of peripheral tension which reacts on every deep organ and tissue of the body. Such a condition may thus be a cause of such things as tuberculosis of internal organs, or hypertrophy of the liver, stomach or kidneys. Again, changes in diet, which is an environmental factor, may alter the materials in such a way that certain proximate principles are lacking or in short supply with the result that the body is unable to repair and reconstruct its own cells, a state of affairs which leads to cellular degeneration which, in the view of some, is not far removed from tuberculosis. Diseases, then, may be looked upon as the result of some interference with blood and nerve supply or some change in the environmental conditions of the body, and the logical method of dealing with them is to remove the irritation or interference so as to permit absolutely free play of the mechanical structures and in the vital relations of the organism. All processes in the body should be looked upon as constructive except those which deal with the destruction of waste or poisonous materials. The constructive processes are in the care of the vital processes which are regulated from the medulla; the destructive processes are in the care of the glands which form a part of the metabolic apparatus.

The principle, then, which should underlie therapeutics is to establish absolute freedom from irritation, obstruction and pressure in connection with all parts of the organism. As a means to this end we apply manipulation. This should be applied first to the soft tissues which are the connecting structures and must be corrected before we can correct or keep corrected the bone structures. The contracted, shortened and thickened muscles must be relaxed, tense and thickened ligaments must be softened and fasciae must be made free. Secondly, the hard tissues, including bone, cartilage and tendon, should be corrected by articulation applied to the framework of the body on the principles of mechanics.

There are three principles of mechanics which are worthy of special mention in connection with articulation; first, the exaggeration of the maladjustment in order to make the structures free for adjustment; secondly, the application of extension to separate the maladjusted structures; and thirdly, correction of the maladjustment by a suitable blend of rotation, articulation and "pull and push". Finally consideration must be given to the adjustment or correction of the environment of the patient, including such things as diet, hygiene and sanitation. If the primary cause of the trouble is a dietetic or climatic factor, or any other environmental condition, this must be corrected, as otherwise the organism will not be able to resume its normal condition.

When the principles of correction have been applied in all the indicated ways, the fluids and forces of the body are liberated from the pressure, irritation or obstruction which has been present and are able to exert a restorative influence upon the diseased parts of the body. In other words the body uses its own native resources to cure and to heal. For example, a Tonic Treatment consists in the restoration of the circulation to normal, the oxygenation of the blood by promotion of the proper action of the lungs, skin, liver, etc, the promotion of the oxidation power of the blood through the metabolic activity of the liver, the detoxification of the blood through the action of the glands, and the assistance of elimination through the kidneys, skin and lungs. Similarly, temperature is to be controlled by the establishment of equilibrium in the thermal apparatus of the nervous system and in the vasomotor system, together with proper radiation and proper functioning of the sweat system. Again, it is possible to stimulate intestinal action by promoting the elaboration and distribution of the normal secretions of the liver and intestines and by restoring the tone of the musculature of the intestinal walls instead of using cathartic medicines. In other cases cathartic action may be established by direct stimulation of visceral motor activity through the nervous system.

In the application of these methods the main point is to find out the obstructive or irritative condition and to correct or remove it so as to open up the blood and nerve currents, to allow the free action of the heart in the distribution of the blood under regulation by the vasomotor system and to bring about the proper distribution of the nerve forces by spinal action. This osteopathic principle of adjustment is applied primarily on the basis of empiricism, because it is only by experience that we can demonstrate clinical results. Nevertheless we seek to demonstrate that this system of therapeutics has a foundation in the physiology of the organism. The distinctive point in our treatment is the application of some adjustive measure such as manipulation, or regulation of diet or climate, such measure being based on the anatomy, physiology, chemistry, mechanics or psychology of the organism. The fundamental object is to call into use the inherent resources of the body in such a way as to make the body itself the agent by which disease is overcome and health restored. In addition to manipulation used in the restoration of normal anatomical relationships, the removal of obstructions and the correction of the flow of blood and nerve energy, we employ every natural method which does not involve the use of anything foreign to the proximate principles of the body. We supply

to the body the raw materials which contain the elements required and allow the body to use these proximate principles in its own restoration, but nothing foreign to the body proximate principles should be supplied. In addition there are cases in which it is essential to stimulate or inhibit physiological processes from the great vital centres of the organism with the express purpose of controlling the activities of the body. This is indicated when the structure is too weak to use the energy emanating from the vital centre, or when the organs are too weak to form their natural chemical secretions. This type of treatment can be specially useful in children's diseases. It must always be remembered that the stimulus must be applied to the vital centre and not to the muscle or organ, the object being to compel the vital centre to function in a proper way.

To sum up, it may be said that the etiology of disease depends on obstructive, irritative conditions associated with disorder in the structure of the body and also generally with something unhygienic, hereditary or climatic which lowers or perverts the vitality of the patient. In any case there is an obstruction of the nerve impulses, a secondary obstruction of the arterial and venous blood, with a resultant inflammation, irritation and malnutrition. In the majority of cases a neurosis is the fundamental thing which underlies disease, including the acute diseases, and it is represented by the weakening of nerve functioning. According to this there is no dividing line between etiology and pathology. The obstructive or irritative condition produces directly an irritation or inflammation which is called pathology but would be better described as hyper-physiology or sub-physiology. The new pathology of Osteopathy is the pathology of perversion or perverted functioning whereas the pathology of the older schools is the pathology of morbid anatomy. This means that before there are any known morbid anatomical changes, we find a perversion in functioning. All cases of disease in which there is a pathological condition started out with either an exaggeration or a diminution of the physiological activity caused by some obstruction or irritation. This produces first a "pathology of abnormal reaction" in some of the functional activities, but when this continues for any length of time the result is morbid changes or the beginning of death of the tissues. These morbid changes have been called pathological but the true pathology is in the abnormal reaction and not in the morbid anatomy.

We come now to the subject of Bacteriology. Some early osteopaths denied the existence of bacteria, but it is clear that they do exist both in benign and malignant forms. The problem is not the existence or

non-existence of germs but, rather, the place which they occupy in the field of disease. Before the disease germ can find a lodgement in the body the body as an organism must be in a weakened or depleted condition. This condition is due to a previous perversion of function, followed by neurosis, and this, in turn, followed by malnutrition. There are therefore three stages in pathology before we come to bacteriology. These three stages are all hyper-physiological stages. Bacteria appear in a state of malnutrition as the results, effects or products of perverted bioplasmic processes and perverted nutrition. As a matter of origin, the germs originate in degenerated bioplasm. It is a truism in biology that life without life is impossible. The life of the germ is the life of a body cell perverted before it comes to the cell stage of life. The type of the germ is determined by the nature of the malnutrition.

We must, therefore, differentiate between two aspects of the problem of bacteria and take them into account in fighting against germs. First there is the origin of germs in the degeneration of the unit forms of life or bioplasts. This process may be looked upon as general at first but becomes more specific as and when the bioplasts find a specific field of culture and a specific germ form. Secondly there is the development of the germ in the field of nutrition in which it finds itself and which determines the type of bacteria. Now in fighting against the origin of germ diseases we must seek to fight them in their pre-bacillary stage, that is in the stage of bioplasmic formation. The main thing here is to establish the upbuilding processes of the body. In fighting against micro-organisms in their particularized forms, such as tubercular bacilli, pneumococci, etc., we must remember that they are the effects of the malnutritive process and that the only way we can deal with them is through the processes of nutrition.

Hence we must bear in mind, (a) that pure blood is the only perfect germicide, (b) that healthy tissue cells are the most active phagocytic agents for the destruction of germs, and (c) that a readjusted organism, including readjustment of all structural activities and the environment, is the only favourable battle ground for the destruction and elimination of germs and their toxins. According to this there are two great ideas which remain to be elucidated by modern bacteriology; first, that the human blood is the only natural germicide for the human subject, and, secondly, that the readjustment of the organism is the only possible foundation for the development of pure blood.

We may take pulmonary tuberculosis as an illustration. The healthy vitality of the lungs depends upon trophic impulses which are supplied principally through the tenth cranial nerve and its branches, and obstruction or irritation of this nerve supply alters these impulses. Thus, before tuberculosis of the lungs is possible there must be a neurosis and probably a degeneration in the field of the tenth nerve. In short, the nerve communicates neurotic influences to the epithelial structures in which it terminates and there is a degeneration of the membranes. The cough and expectoration of exudates are expressions of the irritation and degeneration. A pathological condition of accumulated exudations arises with a degenerated state of the lungs. It is in this environment that the lodgement and development of the tubercle bacillus takes place. The explanation of the success of osteopathy in cases of tuberculosis is to be found in the removal of the obstructive conditions involving the nerve supply to the lungs. The result of this is to check the symptoms, namely, cough, expectoration and night sweats which in reality represent the stage of perverted functioning of the lung and its accessories. During this stage the tissue field is in a state of preparation for the degenerative stages of real consumption. If, however, the symptoms and the degenerative changes are, or can be, controlled, then there is a possibility of initiating a nutritive upbuilding of the lungs to the point at which they are capable of resisting the action of the tubercular germs and eventually throwing them off so that the tuberculosis is cured.

We find a confirmation of this way of looking at things in the writings of Dr. Mays on *Pulmonary Tuberculosis*. He says: "The lesion is not one originating in the local tissues, but in the nervous system; all forms and phases of pulmonary disease are constantly called forth through the instrumentality of vagus disintegration". Behind the pathology of the tubercle formation lies the perverted nerve action and behind this lie the obstructive and irritative conditions which produce the abnormal functioning of the nerves and expose the tissues supplied by them to micro-organic infection.

Bacteriology, then, if properly studied, is capable of contributing to the understanding of perverted physiology in pathological states. This view of pathology makes it possible to lay down a definite proposition, as follows. The only pathways along which nature can transmit impulses or currents of vitality to the different organs and tissues of the body are the nervous system. Neurology teaches us that every organ and tissue is connected in some way with the spinal cord and brain either through the spinal nerves

and their branches or through the sympathetic system and its branches. In this way a connection is established between the spine and every portion of the body. Hence, the failure to receive vital impulses at any part of the body implies a specific lesion or obstruction or irritation. In line with this we will find that congestion, inflammation and degeneration (the three great chapters in pathology) are associated either with failure of venous drainage outside the central nervous system or of cerebro-spinal fluid drainage inside the central nervous system. That is to say, that disturbed circulation following on an obstructed condition of circulation is a contributory cause of all the effects we find in pathology. The irritation, the obstruction or the pressure are due to some type of lesion in the structural sense or in the activity sense.

If what we have been saying is true, nature is attempting to create conditions within the organism which are antagonistic to foreign bodies and foreign substances. This is in line with the proposition laid down by Hippocrates, which practically amounts to this: *That nature always tends towards the normal and tends to preserve the parts of the organism while life lasts by creating normalizing tendencies within the organism.* The thing which Hippocrates did not, perhaps, point out is that the tendency towards the normal is sometimes rendered ineffective by the existence of obstructions. It is here that the function of the physician comes in; namely, to remove the obstructive conditions and allow nature to establish her normalizing tendencies. The object of therapeutics, whether applied by nature or otherwise, is to keep the field of nature as free as possible, so as to allow the absolute or maximum activity of the vital processes. In attempting to establish this absolute freedom the work to be done may be summarized as follows: (1) The relaxation of contracted soft tissues and the contraction of relaxed soft tissues; (2) The adjustment of hard tissues, namely, bone, cartilage and tendinous structures, in their inter-relations. These represent the framework and solid structure of the body as well as influencing the functioning of the fluids and forces as they pass through the inter-related structures; (3) The soothing by inhibition of the irritation of over-active tissues to be done through the nerve centres, (4) The arousing of torpid or inactive tissues by stimulation, also to be applied only through the nerve centres; (5) The establishment of free and uninterrupted currents of vitality by adjusting the entire organism to itself and its parts and by adapting the body to its environment. and vice versa.

PHYSIOLOGICAL AND OSTEOPATHIC CENTRES IN SPINE AND BRAIN

The chart here presented was prepared to show in convenient form the anatomical and physiological aspects of the nervous system and to illustrate the Osteopathic concept of nerve involvement in the spinal regions. On the left of the chart the highest and lowest points of origin in the cord of the spinal nerves is indicated in relation to the units of the vertebral column. This information is based on a complete dissection of twelve cadavers and the preparation of an anatomic map from the dissected nerves. The purpose of this part of the chart is to indicate the limits from an anatomical point of view of involvement of a particular nerve as the result of vertebral lesions or displacements. This often helps us to explain seemingly contradictory conditions because the point of exit from the column is not the point of exit from the cord, and the same principle applies with regard to the entrance of afferent nerves. Nearer in on the left of the chart the physiological regional areas are marked out in accordance with Head's regional distribution of spinal nerves. The idea underlying Head's Law is that a certain segment of the cord supplies a certain section or region of the visceral system, and on this assumption, Head mapped out the spinal cord into definite areas corresponding with the functions discharged by certain organs. This is the basis of the spinal reflexes which are commonly used in the diagnosis of various diseases or conditions because any diminution or loss of reflexes implies an alteration or loss of conductivity, even though the spinal centre remains intact anatomically.

The value of this to us osteopaths is obviously very great and we can interpret and apply Heads Law properly. The law is: "When a painful stimulus is applied to a part of low sensibility which has a close central connection with a point of high sensibility, then pain is felt in the latter rather than in the former." The cutaneous muscles of a spinal area are supplied by efferent fibres from the same region which gives origin to efferent visceral fibres. Thus, by checking the afferent cutaneous fibres we check the efferent visceral fibres and the regional division of the spinal cord enables us to trace back from points of tenderness, cold or pain to the vertebral lesion and thence on to the visceral area and organs which are in a state of hyper-physiology or pathology. The internal viscera being, for purposes of Head's Law, areas of lower sensibility as compared with the muscles and skin of the spinal area we can accept the Law as the physiological foundation of our osteopathic concept of a lesion. According

to this we have marked out on the chart all the physiological centres corresponding to every organ of the body and we can use it to trace out the effects of abnormal functioning of organs on the spinal tissues and to localize the particular spinal area which needs correction in a particular case. We can also use it to trace out the effects of displacement, dislocation, contracture, rigidity of muscles or ligaments in any particular spinal area as they manifest themselves in the alteration of function of organs; for Head's Law, as he himself tells us, works also in reverse.

Head lays it down that certain segments of the cord supply certain regions or organs of the visceral system and on this basis he mapped out the spinal cord into areas corresponding with the organs, as follows:

Heart, Nerve Roots - D1 to 3	Lungs - D1 to 5
Stomach - D6 to 9	Intestines - D9 to 12
Rectum - D12 and S2 to 4	Liver and Gall Bladder -D11 & 12
Kidneys and Ureters - D10 to 12	Bladder - D11 & 12, L1 & S2 to 4
Prostate Gland -D10-12, L5 & S1-3	Epididymis - D11 and 12, L1
Ovaries and Testes - D10	Uterus - D10 to 12, L1 and S2 to 4

The reflexes existing between spine and viscera are useful in diagnosis because any diminution or loss of reflex action involves alteration or loss of conductivity even if the centre continues to be intact. This implies that the origin of all abnormal conditions leading to disease is localised in the pathway of conduction, and, as the sensory pathway is the primary line of communication and stimulation, all primary involvements by obstruction or otherwise are on the sensory side. If and when one or more of the pathways become so obstructed or irritated that inco-ordination or confusion exists among the various stimuli, the result is a pathological condition in the organ supplied. For example, in locomotor ataxia, absence of the knee jerk indicates a diseased condition involving the posterior nerve root and later the posterior column of nerve cells in the spinal cord, while centres in the grey matter and cells in the anterior horn are still normal, at

least in the early stages of the disease. In inflammation of grey matter of the cord, on the other hand, there is a break between central and efferent links while the sensory reflex link remains perfect. For example, in a case of paraplegia involving paralysis of the legs, if and when brought on suddenly by accident or chronic disease, the spinal reflexes become exaggerated owing to the cutting off of the normal inhibitory influence of the higher centres.

The opposite also is true. In a case of degeneration, which implies pathology, this is the climax of disturbed stimulation. This is always associated with the lateral columns of the spinal cord and shows that there has been an intensification of stimulation based on disturbed reflex action of the spinal cord centre originating from the withdrawal of inhibitory influences or increased irritability of the grey matter of the cord itself. Experiments and clinical observation have shown that motor paths in the human pass from one side of the brain to the other side of the body. Most of these pathways cross over the median line in the medulla at the pyramidal decussation and continue downwards in the lateral column on the other side of the cord, the rest descend on the same side in the anterior column and do their crossing in the cord. The sensory paths also cross from one side of the body to the opposite side of the brain and this crossing has now been shown to take place in the medulla above the pyramidal decussation. This is why tenderness, pain, rigidity and actual lesions are found in area C1 to 5 in both sensory and motor disturbances.

On the right side of the chart are shown the nerve connections from the spine which pass out via the spinal nerves and the various rami, through the sympathetic ganglia and finally through the great prevertebral plexuses to all the different parts and organs of the body. This side of the chart thus illustrates the distribution of central nervous system energy by way of the sympathetic nervous system and indicates the close tonic and trophic relationship of the body to the spine through the sympathetic nervous system.

THE GREAT SPINAL CENTRES

These represent the spinal nerves and their distribution from the spinal column governing the regenerative, reparative and reproductive processes of the body.

Brain. General C2, 3 and 7. Vasomotor D2 to 6.

Eye. Vasoconstrictor C2 and 3. Vasodilator D2 and 3.

Ear. The ear proper and all functions in the internal and middle ear and the eustachian tube C2 to 6. Correlation of the ear in relation to nose and throat C5 and 6.

Nose. Vertebral centre in connection with spinal nerve supply and sympathetic centres via the SCG, C2 and 3.

Pharynx and Larynx. Pharynx spinal nerve supply C3 and 6. Larynx sympathetic nerve supply via MCG, C5 to 7.

Oesophagus. Spinal nerve supply and visceromotor nerve function, C2, 3 and 6.

Thyroid and Thymus Glands. General C5 to 7. C7 has special importance in connection with head of first rib and spinal nerve supply which brings it into contact with the upper thorax. D1 is concerned with the secreto-motor function in close relation with vasomotor centre at D2.

Heart. C2 and 3, C6 and 7 via MCG. D2 to 4 via the 10th Cr. In relation to and through its sympathetic function in the ICG with accessory fibres from the MCG.

Lungs, Pleura and Trachea. D2 to 5 via 10th and 11th Crs. and intercostal nerves.

Bronchi. D2 and 3 and ribs via brachial plexus. Heads of ribs important. Note also that this is the specific lesion area in Angina Pectoris.

Diaphragm. C3 to 5 via phrenic nerve and the vasomotor function (constrictor) which operates through the sympathetic ganglia.

Stomach. General D6 to 8. Cardiac orifice D6 and 7. Pyloric orifice D8. Correlation between the two takes place conjointly via D6 to 8.

Intestines. General D9 to 12. This area concerned with visceromotor function of spinal nerves in connection with intestinal peristalsis.

Centre of Vasomotion. D12 can be regarded as the haemorrhage lesion.

Colon. As distinct from the intestines and separated from them by the ilio-caecal valve, L1 to 5.

Rectum. This is below the level of the control action of the 10th Cr. nerve and the area for it is L1 to 5, but S2 to 5 is the area concerned with the para-sympathetic outflow to the rectum which passes direct via the spinal nerves without synapses in sympathetic ganglia or plexuses.

Liver. General D6 to 10. D6 to 8 (right and left) is the special liver and spleen area. D7 and 8 is a joint centre concerned with the rhythm of hepatic and splenic activity. The Gall Bladder from the visceromotor point of view is localised at D10. The Spleen

in relation to its activity as an independent organ concerned with blood destruction and reconstruction, D8 and 9 (left).

Pancreas. Is really accessory in its functioning to the liver and spleen. Its general control occurs at D7 and 10.

Kidney. D9 to 12, especially in relation to visceromotor functioning. Here lies the real splanchnic area operating on the kidney both directly and through the renal plexus. D12 marks the real visceromotor centre in connection with kidney rhythm.

Suprarenals. Controlled from the secretomotor side, D8 to 10.

Ureter. Its functioning is centralised at D10 in connection with the pelvis of the kidney and the upper ureter, especially from the circulatory and vasomotor point of view. L1 is concerned with the lower ureter chiefly from the visceromotor (peristaltic) point of view and in its connection with the bladder.

Bladder. There are three areas to be considered from the functional point of view.

(1) D11 and 12 is the field concerned with control of bladder distension and therefore of lesions causing over distension. Strong inhibition here will control over distension.

(2) L1 is the centre concerned in efficiency of the bladder in contraction for the purpose of emptying its contents. It is the visceromotor centre and the site of lesion in suppression of urine due to inefficient bladder contraction. Apply stimulation here when the bladder cannot perform its rhythmic function of visceromotor contraction.

(3) S1 to 4 particularly represents the musculature of the bladder in connection with the peristaltic movements of the bladder functioning as an organ. This is the parasympathetic field of urinary control and is the site of lesion in inflammatory conditions involving the inner lining or wall of the bladder.

Prostate Gland. Two special areas are involved.

(1) D10 to 12 is concerned with dilation from the side of circulation. In cases of enlargement with hardening there is rigid compaction here.

(2) L1 is the visceromotor centre and is the site of lesion when the gland is enlarged and soft.

Epididymis. Again two areas are involved. D11 and 12 in connection with vasomotion and L1 in connection with secretomotion. The functioning of the organ is determined by lymph circulation whereas that of the prostate is determined by blood circulation. Therefore, in the case of epididymis secondary lesions are found at L2 or below but in the case of the prostate at D12 or above.

Male Genital Organs. Four centres.

(1) D10 to 12 vasomotor dilator in relation to the blood.

(2) L1 to 3 visceromotor in relation to contractility.

(3) L2 to 5 visceromotor in relation to co-ordination of muscle activity.

(4) S2 to 4 dilator in relation to blood functioning, parasympathetic control over blood volume as the foundation of the secretory process.

Ovary. Two distinct centres.

- (1) D10 to 12 vasomotor constrictor in relation to blood circulation.
- (2) L1 to 5 visceromotor in relation to organic functioning on a rhythmic basis.

Fallopian Tubes. Two centres.

- (1) D11 and 12 vasomotor dilator.
- (2) L1 to 5 visceromotor in relation to activity of the tube from the point of view of rhythmic peristalsis.

Uterus. Three centres, and a subsidiary centre.

- (1) D10 to 12 concerned with contraction of the uterus and also vasomotor constriction in connection with secretory function.
- (2) L1 visceromotor in connection with the organ as a unit.
- (3) L1 to 5 visceromotor in connection with rhythm of the organ. The rhythm deals with the fibre and muscle structure in the organ and so here the different parts of the uterus are controlled at different points.
- (4) 5L to 4S specific centre for os uteri in connection with dilation and contraction, the normal balance of these two functions and also the normal constrictor action of the uterus as a whole in maintenance of the tone of the organ.

Vagina. Two centres.

- (1) L1 to 5 represents vasoconstriction carried down to and through the pelvic plexuses to the vaginal walls. It is the area of sympathetic nerve control in contrast to:
- (2) S4 which is the centre for peristaltic movement. This is the parasympathetic action coming direct by way of the spinal nerves and it balances the visceromotor activity of the other centre from the sympathetic side.

Extremities: Arms.

- (1) C4 to 7 visceromotor action operating through the muscles of the arm.
- (2) D2 to 5 vasomotor action operating by vaso-constriction.

Extremities: Legs.

A. Visceromotor:

- (1) L1 to 5 visceromotor established through sympathetic ganglia.
- (2) S1 to 4 visceromotor established via the parasympathetic nerves, direct and not through sympathetic ganglia.

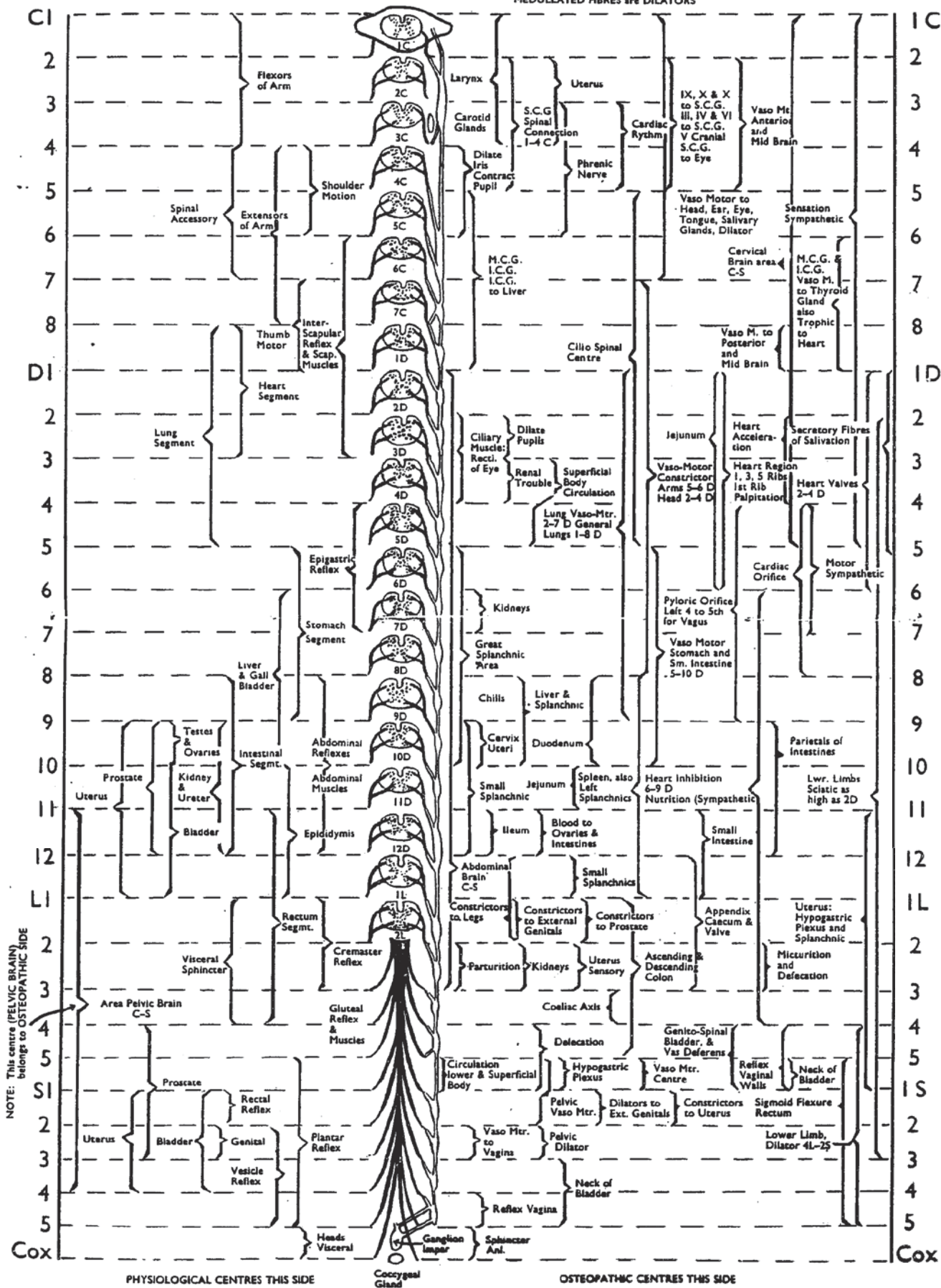
B. Vasomotor:

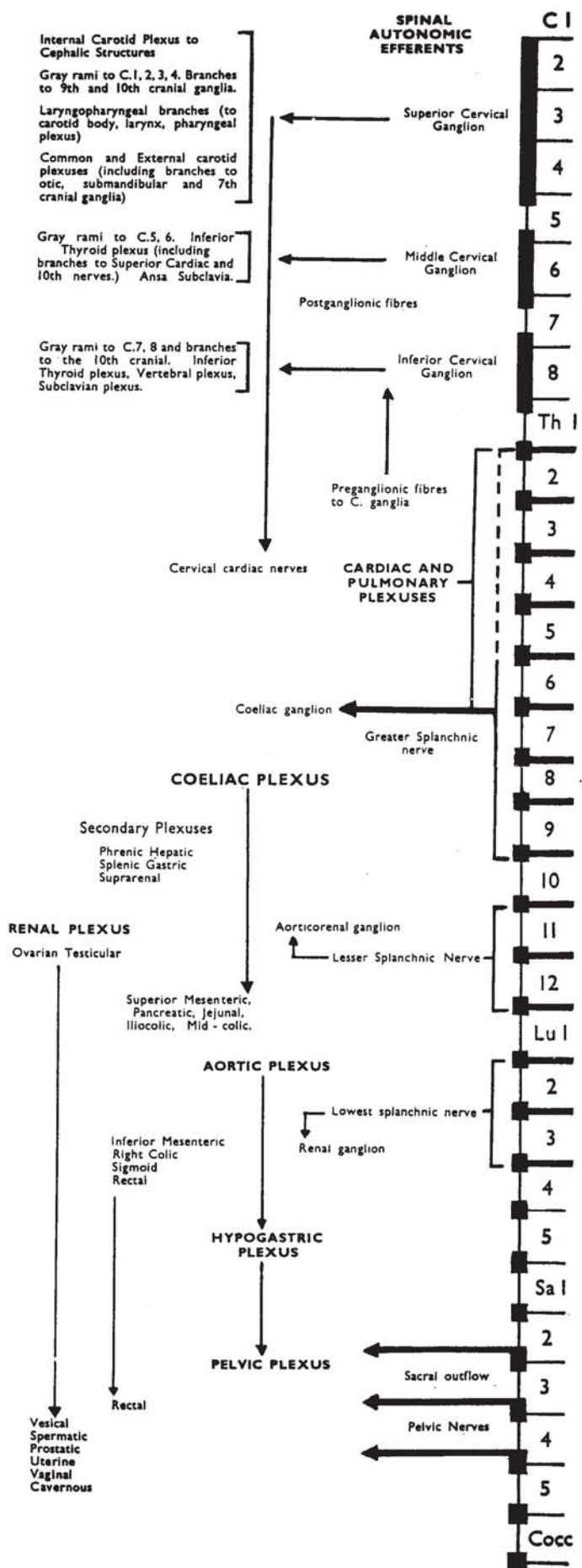
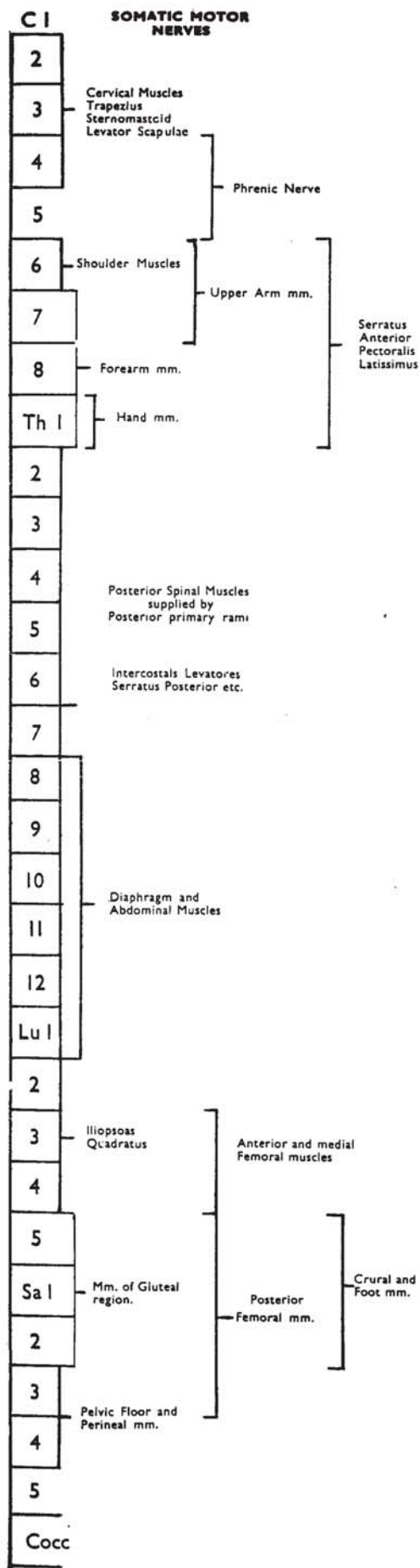
- (1) D6 to 12 direct vasoconstrictor control to the vessels of the legs.
- (2) L1 and 2 vaso-dilation distributed directly through the corresponding spinal nerves, but operating through the lymph circulation only.

COPY OF CHART by
Dr. J. M. Littlejohn

VISCERAL BRANCHES of 3rd, 7th, 9th, 10th and 11th
Cranials correspond with WHITE RAMI

— MEDULLA —
GREAT VITAL CENTRES — Representation of Cardio Inhibitory — Vaso Motor etc.
VASO-VISCERO CONSTRUCTORS 9th, 10th and 11th Cranials with Sympathetics
demdelated as they pass out of the Ganglia Centres
9th, 10th and 11th CRANIALS pass out of the Sympathetics with no Ganglia Connections
MEDULLATED FIBRES are DILATORS





THE TECHNIQUE OF A. T. STILL

PHILIP A. JACKSON

It is with some diffidence that we attempt to present for you today a demonstration of some of the techniques used by Dr. Still in the early days of osteopathy. The difficulties which we have to face are obvious. Still died over forty years ago, and there are very few osteopaths alive today with personal knowledge of the old Doctor. Osteopathic technique has evolved since his day to the point where many of his original techniques are rarely seen and are in danger of being lost to the profession. Still's methods were essentially simple. In his own words "You will find making the bony adjustments to be the easiest part of osteopathy. All you have to do is to carry them through their normal physiological range of motion without force or injury, keeping in mind that in any joint carried, much less forced, beyond its physiological range of motion the ligaments are damaged beyond repair. And injured ligaments are like fractured bones; how long they will remain painful to the patient depends on how long the patient lives."

Hildreth says of them "Dr. Still's technique was marvellous, many times beyond our comprehension, but his methods were so simple it is hard to understand how he could accomplish so much." Perhaps the explanation is given in Still's own words and again recounted by Hildreth. Let me read you what he says.

"Dr. Still said to me one time when we were discussing methods of approach to patients, 'Do you know, Arthur, when a patient comes to me for examination and begins to talk to me about symptoms, how she suffers, and what her trouble is, I seldom observe the patient's clothing. I never notice whether she is beautifully dressed and wears silks and diamonds or covered with homespun cloth. I am listening to her story, and while listening, I am seeing in my mind's eye the combination of systems which go to make up the whole of that body structure. I am concentrating on her story, trying to determine through the description given to me the structural alterations which have occurred to produce the symptoms described.

"I am seeing first the bony framework and the joints which hold it together as one system, the foundation upon which all other structures in the human body are built. I am seeing, especially, the positions of those bony parts and their relationships, one with the other. Then I see the

ligaments which hold that framework together, connecting and covering the bones at their joints from the toes and fingers to the base of the brain, marvellous creations of strength that make firm the bony structure. Then I see the muscles inserting in various ways all over the bony framework, some of them covering the ligaments and others beginning and ending in them. They are placed to give needed protection to the framework and at the same time move the bony parts in such a marvellous way, with such harmony that it is hard for the mind of man to conceive of the perfection of their functions.

“I am also seeing in my mind’s eye the nervous system, the system which acts in the same capacity in the human body that the telegraph system acts in the commercial world for the interchange of thought. The difference between the nervous system of the human body and the telegraph system which encircles the globe is that one is man-created and the other is divinely created, God-made, if you will. While listening to a patient’s story, I try to visualize the anatomy of the nervous system in all its relationships, in every function of the body. The nervous system is one of the most marvellous mechanisms ever created.

“I see its division into the cerebrospinal part and the sympathetic part. The first is made up of the brain, the spinal cord, and the spinal nerves and their branches, reaching out to all muscles, joints, and skin, conveying messages to and from the brain of movement, temperature, pain, etc. The second or sympathetic part is composed essentially of chains of nerve ganglia extending from the base of the brain to the tip of the spinal column, controlling the functions of the internal organs, the circulation of body fluids, and nutrition to the various body parts.

“When you stop to consider how these two great systems are joined together, how they communicate one with the other, you have, in my opinion, the most supreme example of the perfection of the work of the Divine Architect. Each is an individual nerve system, yet so created as to enable nerve impulses to pass from one to the other.

“I further see the arterial system, with its great and small avenues for carrying the blood to every portion of the body. Not a body cell is overlooked. All types of nutritional material and oxygen are carried in that blood stream, substances needed to repair worn-out cells, to grow hair on your head and nails on your fingers, the needed materials for vision and hearing, bone building material, etc. The mechanism whereby these

materials are transferred from the blood stream into the vital living cells of the body is beyond description, almost beyond understanding.

“Then I visualize the venous system, another great system of vessels which carries away the waste products to the organs of elimination. There is still a third and most important system of vessels which accompanies the arteries and veins throughout the body. This is known as the lymphatic system. It supplies the serous fluid in which the tissue cells are bathed. It has to do with the mechanism of nutrition, absorption and the protection of cells from harmful poisons and bacteria. And last but not least I see the glandular system of the body and wonder how it brings about its effect in each particular case.’

“Such was Dr. Still’s line of thought as he listened to the complaints of a patient.”

How many of us could claim such perfection of approach to our cases? It seems beyond doubt that to Still was given an insight into the structure and functioning of the human body probably unequalled in any of his successors, and this coupled with the years of intense study which he gave to his life’s work allowed him to achieve results with an ease and simplicity that those with lesser gifts cannot match. However that may be, it seems to us that it is well to keep in mind this principle of simplicity in technique, coupled with close attention to detail, and to make it our object to achieve the results we desire in as effortless a way as possible, and we hope that it may be valuable to try to demonstrate to you our interpretation of some of the techniques described in the writings of Still himself and of his early followers.

For diagnostic purposes Still divided the spine into sections, each section representing the so-called centre of control for the various parts of the body. Most of the sections comprise four vertebrae and he listed them as follows: the upper cervical, lower cervical, upper dorsal, middle dorsal and lower dorsal, upper four lumbar, and fifth lumbar and sacrum. In treatment although he paid particular attention to the section most closely connected with a given condition it is noticeable that he invariably included other areas as well, and it is clear that in the majority of his cases the entire spine came under review, as evidenced by his insistence on the close relation of the sacral area to the upper cervical – a relationship that is being especially stressed at the present time by researchers in the cranial field of osteopathy. Again he was insistent that in ovarian disorders it was essential to treat the upper dorsal area. He gave no reason for this but we should probably agree

that the explanation is to be found in the effect upon the thyroid gland. He had a very clear understanding of the physiology of the autonomic nervous system, and he was fully aware of the effect upon the abdominal plexus of lesions of the upper cervical and lumbo-sacral areas. Asthma he related specifically to the fifth and eighth ribs especially on the right side; a view which is widely held today, though with some modification.

A good example of the completeness of the approach is seen in his treatment of diarrhoea. "I will now give you one of many methods that have proved effective in many cases of diarrhoea, which I have been called upon to treat. When my patient is a stout man I generally stand him in a doorway and place his breast and abdomen against the jamb of the door. I then stand behind him and place my knee on the upper part of the sacrum so as to bring the spinous process of the fifth lumbar against my knee and give fairly strong pressure. By taking hold of his shoulders I bring his back firmly towards my knee with the object of raising the fifth lumbar from the sacrum. Then swing him to the right and left a few times so as to open out and loosen up all of the lumbar articulations with a view of freeing the whole nervous system of the lower spine from any impingement whatever. Now I turn my patient so that he will face me with his back against the door-jamb. I take him by both shoulders, and push them backward to secure good blood circulation of the upper dorsal region. Now seat the patient on a stool, stand in front of him and have him place both his arms over your shoulders. Place your arms around his body with your hands each side of the twelfth dorsal vertebra, the place of beginning of this part of the treatment. I carefully examine and adjust every dorsal vertebra and also the ribs which articulate with them. With my hands each side of the spine I gently but firmly draw the patient towards me and know that freedom is given the blood and nerve supply in this region. The clavicles and the cervical vertebrae now receive careful attention and adjustment, not leaving my patient until I have perfect articulation from the sacrum to the occiput. When there is much headache I generally inhibit the occipital nerves in the back part of the neck."

His self-treatment for what he calls shaking palsy is also worthy of note.

"In two or three months afterwards I had shaking palsy of my head and neck. I examined the union of the seventh cervical with the first dorsal and found the facets on the upper surface of the first dorsal were shoved to the right on the under facets of the lower cervical which were slipped sideways and almost off from the facets of the upper dorsal. The under surfaces of

the second dorsal facets were almost pushed off the upper surfaces of the third. I took my walking cane which is bent so as to form a hook for a hand-hold. I fastened this cane in a vice and brought the hook end down below the bulge that was on my neck and with great force I pulled back until the lock was separated. After adjusting my neck I proceeded to have my ribs as low down as the eighth on the left side adjusted, and the shaking of my head stopped. On examining others I find about the same condition of neck, spine and ribs. Upon careful examination of the vertebrae of the cervical and upper dorsal, the student will see at once that all the facets have a limit of motion, a stopping place. When thrown by force strong enough to disarticulate the facets to the right, left or backwards from the absolutely normal, we have a condition that the muscles labour to overcome, a condition that will produce shaking palsy.”

We may now attempt an appraisal of Still’s technique and try to see how far we have come in fifty years of progress. It is evident that he and his early followers were supported in their work by a zeal and a belief in their principles which carried them triumphantly through their early difficulties and gave them courage to attempt things from which many of us might shrink today. Nowhere is it more true than in the practice of osteopathy that confidence in underlying principles and in one’s own ability to carry them out is half the battle. It seems to us that one disadvantage of increasing knowledge is a corresponding decrease in one’s belief in simple things. We believe that the history of osteopathy demonstrates this very clearly and it should give us cause for real concern. In large measure the early faith in fundamental osteopathic principles is being lost in the ever increasing mass of new medical discoveries, and it is our belief that unless the torch can be rekindled the practice of osteopathy in its best form will be steadily lost. And we believe that a study of Still’s philosophy and methods is one of the best ways to rekindle the flame.

Two things especially stand out in Still’s conduct of his cases. One is the great attention which he paid to the soft tissues, as an essential preliminary to the all important bony correction. He would not make a correction until the soft tissues had been prepared to the point where the correction had a reasonable chance of being maintained, and in many cases it is clear that treatment was continued over a long period. He was no lightening bone-setter. Dr. David Clark, one of his most ardent followers and one of the greatest of the old time osteopaths, carried this soft tissue preparation to a very high level, and it was his aim never to make a correction twice. The stimulus for this ideal was the fact that an injury to his own neck was

treated by Still daily for three weeks by soft tissue treatment only, before any correction was made. The second point is his insistence on the principle of find it, fix it, and leave it alone, and this remains as true today as in Still's time. All will agree that an accurate diagnosis is more than half the battle. Through the years many aids to osteopathic diagnosis have been described and the passage of time has no doubt improved our standard in this difficult art, but the trained palpatory sense and the ability to interpret what the fingers find is still an essential quality in finding the lesion.

In the actual correction of the lesion we feel that we are entitled to claim some advance upon many of the techniques used by Still. It has been said that his technique was simple, but this is only partly true. We ourselves have found some difficulty in carrying out some of his manoeuvres, and although this can be partly explained by the admitted difficulty in following written descriptions of technique, we believe that succeeding generations of osteopaths have found easier ways of carrying out many of his techniques and to this extent we may legitimately claim to have advanced.

The point at which a lesion is considered to be properly corrected and should be left alone remains a matter of fine judgement, and we believe that it is one of the most important attributes of good osteopathy. Failure to stop when correction is obtained and the repeated application of force to a normalized joint is one of the worst services we can render our patients and the rule of leave it alone cannot be too strongly stressed.

For our demonstration we have chosen a selection of techniques for each area of the spine which we think are in least common use, and we hope that by general discussion it will be possible to show whether more modern techniques or later modifications of the earlier ones are more effective than Still's, or whether there is not something to be gained by the reintroduction of his original methods.

THE A. T. STILL TECHNIQUES – ILLUSTRATED

The first two photographs showing the patient seated and the operator standing in front are techniques which are described by Still as designed to free the vertebral artery and as a treatment for headache. The hands are placed at the back of the neck with the fingers on the transverse processes of the cervical vertebrae, in which position a gentle pressure is applied until the neck is well adjusted. In the case of headache Still goes on to say "I begin in every case at the occiput by laying my fingers flat on the back of the neck over the occipital nerves. Here I bring a gentle and firm pressure for a few minutes during which time I find the muscles relaxing under my fingers

on both sides of the neck from the base of the skull to the fifth cervical vertebra.”

Illustrations 3 and 4 show a technique for the relief of stiff neck of which Still writes the following: “Often people get up in the morning with a stiff neck, a condition which I have generally relieved by standing on the side opposite the one affected, and placing the flat of my hand so as to cover the lower part of the neck, and one or two of the upper ribs. I bear down strongly, and gently, with the hand that is on the lower part of the neck, and, while holding firmly, push the head from me with the other hand. Then I move the head backwards and forwards, and towards the hand that is on the ribs and muscles.”

Numbers 5 and 6 show the positioning and movement for the correction of lesions in the upper dorsal area. This simple but effective technique was favoured by some of the older osteopaths and is attributed to A. T. Still. The technique shown in number 7 is especially valuable in the treatment of flexion lesions in the upper dorsal. Illustrations 8 and 9 show the application of arm leverage to the dorsal area. This is a long leverage technique which was taught and practised by J. M. Littlejohn, and is attributed to A. T. Still.

The technique number 10 is described by A. T. Still in which he says: “I hold his body fast between my knees and adjust all variations from the truly normal between the sacrum and the occiput, being very particular with those from the sixth to the tenth dorsal.” Number 11 is an A. T. Still technique and is described as a hip joint technique in which tension is applied in order to gap the joint.

The sequence of movements shown in numbers 12, 13 and 14 for the correction of the posterior ilium are described by Hildreth in his book *The Lengthening Shadow of A. T. Still*. Number 15 is a reverse shot of the same technique, showing the hand position more clearly, while number 16 indicates the hand position for the correction of the anterior innominate.

The “door jamb” technique for the correction of the upper ribs was used by Still as a treatment for asthma and is here shown in three stages in the pictures 17, 18 and 19; he describes the technique in the following words: “I place the back against the jamb of the door holding both shoulder blades squarely and firmly in place against the jamb. I then take my patient’s right arm with my right hand, place my left hand under the back of the axilla, carrying my fingers along the spine two or three inches above the lower border of the scapula so as to get my fingers on the offending rib or ribs at

their articulation with the transverse processes of the vertebrae. Now I raise the arm up strongly pressing my right shoulder against the patient's sternum, bringing the arm straight up, high and parallel with the spine and head. While in that position I throw the arm backward, and firmly hold it up until I can pull the rib well up or down and in place. Now I draw the arm across and return it to the side, keeping my fingers firmly against the offending rib until it finds its place." The patient's position is then changed as in number 20, concerning which Still goes on: "After this is done I turn my patient's breast towards the door jamb, and, beginning at the eighth rib with my thumbs, I push up or down all ribs, even to the first, and know that every articulation is absolutely correct.

Still also used the door-jamb technique for treatment of the clavicle (21, 22, 23) as follows: "Stand your patient against a door-jamb with his face toward you. Put your hand on his shoulder, push the arm back sufficient to make a gap or opening between the outer end of the clavicle and scapula and then bring the arm with an upward tendency square towards the forehead. Alternatively, he would employ an assistant to press firmly against the opposite shoulder while he grasped the arm at the elbow bringing it forward upward and outward, having the fingers of the other hand over the outer third of the clavicle. He goes on: "I draw the clavicle forward while taking the arm strongly up and out, and when I know the clavicle is pushed far enough to make a separation between it and the acromian end of the clavicle, I bring the arm backward and downward to the side holding the fingers on the clavicle as described. Then I push up on the arm with sufficient force to bring the scapula up above the acromian end of the clavicle. While in this position I bring the arm across the face with an upward motion. Now let the arm fall to the side and the work is done." The modern equivalent of this technique is demonstrated in the following group of pictures (24, 25, 26) the same leverage and hold being applied to the patient in the supine position.

The method employed by Still for "neuralgia or rheumatism of the shoulder" is shown in the next set of three pictures (27, 28, 29). For this purpose he places the patient on a stool or chair and brings the arm out at right angles and if there is much tenderness the knee is placed under the axilla with the foot resting on the stool beside the patient. He goes on: "I bring the arm down over my knee and swing it backwards and forwards, then bring it up and across the face." He remarks that other methods are just as good and that our object should be to adjust the bones regardless of any special method.

The door-jamb is again brought into operation for adjustment of the fifth lumbar and was used by Still as a corrective for “diarrhoea in a stout man” (30). With the patient standing facing the door jamb the operator places one knee on the sacrum and applies a fairly strong pressure to the spinous process of the fifth lumbar vertebra. Says Still: “When my patient is a stout man I generally stand him in the doorway and place his breast and abdomen against the jamb of the door. I then stand behind him and place my knee on the upper part of the sacrum so as to bring the spinous process of the fifth lumbar against my knee and give fairly strong pressure. By taking hold of his shoulders I bring his back firmly towards my knee with the object of raising the fifth lumbar from the sacrum.” Photograph number 31 is the modern equivalent using the stool rather than the door jamb in the standing position. Photograph number 32 represents the door jamb technique for the correction of an up-posterior lesion of the ilium.

THE TECHNIQUE OF J. MARTIN LITTLEJOHN

T. EDWARD HALL

It is unlikely that many of the members of this Institute ever knew the late Dr. J. M. Littlejohn and I thought it would be appropriate as an introduction to this demonstration if I told you something about him. He was a remarkable man in more ways than one, and essentially a scholar although he would never argue or take part in a discussion, so that getting direct information from him was always difficult. He was a man of short stature with a kypho-lordotic spine which was, I am sure, completely ankylosed and provided him with a natural, compact and powerful leverage. He was not, as we would say today, a “specific technician”. He used to give specific treatments but he was an exponent of what is now described as long leverage technique, whereas most of our techniques which are in common use today employ a short lever. Having recently demonstrated some of the A. T. Still technique, it is fitting that this should be followed by a discussion of the Littlejohn technique, although his methods do not lend themselves to demonstration or to the correction of individual lesions in quite the same way. In a general way his work was based on a favourite axiom of his, which stated that whatever had been done to the patient, or whatever correction had to be made, it was essential to “give the body back to itself”. By this he meant that after making the so-called “specific correction”, the whole body should receive attention. This involved thorough articulation of the spine and he stressed the importance of directing the movements of articulation upwards or downwards along the spine, according to his physiological approach to osteopathic treatment in the particular case. He used to say “The foundation of Technique is the Posture of the Body and the Physiology of the Spine”. If you care to study his lectures on gynaecology or obstetrics, his technique of treatment was always based on this principle, which, I know, does get results in the treatment of these conditions.

Littlejohn stated repeatedly that the individual lesion should never be treated as such but should be adjusted in relation to all the adjacent structures, and it was for this purpose that he applied the long leverage technique. This method is quite excellent provided the operator has an intensive knowledge of the anatomy and mechanics of the body and is able to apply the leverage in the adjustment of any part of the body. I think it would be true to say that I have never seen an osteopath use the upper and

lower extremities in the correction of spinal lesions more than Dr. Littlejohn and, although I have been teaching this technique for many years, there is no doubt that it has tended to be disregarded in favour of the “short, sharp, snappy technique”. Littlejohn’s technique was anything but this. In these days of speed in all things we are anxious to obtain quick results, and it appears that we are more keen to know how to make an adjustment than to know the reason why an adjustment should be made, and I think this is the reason why the short lever technique has replaced the long leverage method. I can only remember Dr. Littlejohn making a specific correction on three occasions and he only consented to do this as the result of a direct challenge from myself. He would never demonstrate correction of the individual lesion by specific methods to students but there is no doubt that he could do it. He lectured on the subject of technique and practice to the extent of some sixteen bulky notebooks.

As you know, Dr. Littlejohn founded the British School of Osteopathy and three of his early graduates became his assistants, so that he seldom gave treatment alone. Perhaps it is for this reason that when some of his treatments are attempted without an assistant they appear to be less effective than was originally the case. These assistants would be employed holding the neck and shoulders or flexing the head while he worked on the dorsal spine. Or perhaps they might flex a limb, apply traction to a lower extremity or support the pelvis as he moved the fifth lumbar. In demonstrating to his students there were seldom less than four working on a lesion; we used to call it “Littlejohn and Team Technique”. I have seen as many as five students each pulling on a finger as he adjusted the carpal bones. This is sound enough osteopathy and gives good results but we do not all possess five assistants, so that we have had to develop into individual osteopaths and do specific work. Nevertheless, if you read his books on *Applied Anatomy* and *Applied Physiology* you will find that in teaching these basic subjects he correlated them to the technique of osteopathic treatment throughout.

In practice Littlejohn always emphasised the importance of posture but he claimed that it was impossible to expect a patient to control a corrected posture if there was any weakness in the floor of the perineum, and he used a number of techniques for the treatment of this condition. With the patient in the prone or supine position the thumbs or fingers are inserted just medial to the ischial tuberosity and into the pelvic floor, gradually working more and more deeply into the soft tissue. It is quite simple in operation and is not in the least spectacular. There can be no doubt that

Dr. Littlejohn was outstanding in the technique of osteopathy but his methods were simple and were never designed to catch the eye of the onlooker. For example, in mobilising the cervical area, the fingers of one hand are employed to hold the spinous process of a vertebra and straight rotation is applied over this fixed point. In the case of the common cervical lesion in which there is sidebending accompanied by rotation into the concavity, fixation is applied to the lower of the pair of vertebrae in lesion, and mobilisation can then be effected by means of rotation which is not characterised by a crack but the movement of correction can, and should be, observed through the fingers. To appreciate this form of technique, it can be a good plan to remove all “cracks” from the neck before making a correction. This mobilisation technique can be used in all the cervical area including the occipito-atlantal articulation. The principle of fixing the lower vertebra of the two in lesion and applying some form of leverage to the upper vertebra may be used throughout the spine, especially in those techniques in which the patient is sitting or standing. The reverse of this is true in the side lying position in which correction is made by a cross-thrust as a rule to the lower of the two vertebrae in lesion. It has been said that rough handling of the neck has lost osteopathy more patients than that of any other part of the body, but the kind of Littlejohn treatment as outlined above could not be so described and is unlikely to disturb the patient unduly.

Once again, in the treatment of the occipito-atlantal joint Dr. Littlejohn was in no way spectacular. No thrust was used, and the movement consisted simply of fixation of the atlas and straight rotation of the occiput. Assuming that we have an occiput which has moved upwards and *anteriorly* on the right, fixation is then applied by the thumb to the atlas on the left and *anteriorly* with the fingers reinforced on the apparently posterior aspect of the atlas on the right; the occiput is then rotated to the right. To make doubly sure of correction the hand positions are reversed and a thrust-push given to the atlas with the thumb as distinct from the original movement which was a pulling round of the occiput rather than a thrust. Adjusting this lesion via the atlas is the finest example of Downing’s axiom that specific correction necessitates a high velocity in a short amplitude of motion, and, although it might be true that we can afford to “go slow” in the correction of any other lesion and vertebra in the body, this is not the case in the correction of the atlas which requires great speed in execution.

If one considers for a moment the mechanics of the occipito-atlantal articulation it is clear that we have here the reverse of the tripod mechanism which is characteristic of the rest of the spine. It has two support foundations with the apex represented by the ligamentum nuchae, whereas in the other parts of the spine the body of the vertebra is the foundation with the articulating facets as the supporting and directing accessories. In any case, the degree of movement is very small, whether the lesion is one of side-slip, side-bending or rotation, and correction of this lesion must be specifically made in a rotatory direction, with speed. This means that unless you are very specific in adjustment there is much to be said for Littlejohn's method, because it lends itself to a considerable degree of control.

Except for the purposes of articulation, Littlejohn did not generally favour specific rotation but preferred a direct pull and push on the vertebrae. A fulcrum is made with the fingers on either side of the spinous processes above and below the vertebra in lesion and in this manner a considerable purchase is brought to bear even without flexion or forward bending. Another very powerful method is the "crossed thumb" technique which is particularly valuable for flexion lesions in the dorsal area, or in the kyphotic spine. It could also be used in extension lesions in which case the thrust is applied to the vertebra below the lesion with the object of breaking fixation between the joints.

Where curvatures of the spine are concerned, they must of course be approached from the point of view of the physiological movements of the spine, and there are certain key-points which must receive particular attention before any attempt is made to break them down. Littlejohn always stressed the necessity of *freeing* flexion and extension before attempting any rotatory movement. It is important to remember that we are ill-advised to take on a curvature case, certainly after the age of fourteen, unless we are in a position to control the progress of treatment for a period of anything from one to three years. If the treatment is interrupted when the curvature is only partially broken into, it can only become worse. There are certain overall movements which may be usefully employed in these cases, and, although it is not always possible to normalise a curvature completely, it can be brought closer to the mid-line. If we consider a group with lateral movement to the right in the dorsal area which is sidebent left and rotated to the convexity, i.e. to the right, we must begin by taking out the sidebending on the concave side by means of traction and follow this with a rotatory springing movement towards the mid-line of the body. In

the lumbar and lumbo-dorsal areas there often occurs a convex curvature which has not become organised and is really functionally compensatory to a fifth lumbar or pelvic lesion. We must remember that the lumbo-dorsal is a mobile area so that seventy-five per cent of these curvatures are of this type, and lend themselves to postural accommodation and thereby are amenable to correction.

This springing technique may also be usefully given to the dorsal area by placing the patient in the side-lying position with the operator facing the patient's knees in full flexion. This method is probably more effective and less difficult to perform than that in the sitting position. I have always taught that a technique which looks easy and places no undue strain on the patient or operator is a good technique, and we should take care not to neglect any method of correction on the ground that it is too simple. None-the-less, there are certain points which must be noted. Purchase power can only be brought to bear on the ribs when the pelvis and knees are properly immobilised, and if the operator fails to occupy the correct position in order to hold the knees, or neglects to support the pelvis, the leverage is lost. It is for this reason that merely copying technique is valueless unless it is fully understood. Another point to note is that, contrary to the usual practice in these sidelying techniques, the trunk is not rotated and pulled forward into flexion but left in the mid-line. From this position the patient is then rolled forward slightly to enable the hand to be placed beneath the convex side of the ribs in order to embrace the angles of the ribs, then the patient is allowed to relax again into the initial position and is then rolled on to the hand under the ribs. This is important.

In Littlejohn's technique for the correction of a posterior innominate the patient is placed in the supine position and the operator stands on the lesion side. The leg is then carried into flexion and levered away from the operator to enable the hand to be passed under the sacrum with the palm uppermost.

From this position the flexed knee is slowly abducted and the great trochanter directed into contact with the inner aspect of the operator's wrist. This is the point of fulcrum for the leverage and is essential for the successful execution of the technique. Abduction is continued until the knee can be conveniently tucked under the operator's axilla and the operator's free hand is placed over the anterior superior spine of the ilium on the opposite side to stabilise the pelvis. Leverage is then applied from the axilla as the wrist elevates the trochanter and the fingers support the

posterior superior spine of the ilium to bring the innominate forward. This is a very powerful technique and is particularly useful when the sacro-iliac joint is in a state of extreme rigidity irrespective of the direction of movement, and is specially valuable in treatment of the ligaments surrounding the sacro-iliac joints. Having loosened the sacro-iliac joint in this manner the hand controlling the pelvis on the opposite side is now employed to grasp the outer aspect of the foot on the lesion side, the leg now being in semi-flexion with the knee supported by the operator's abdomen; the hand beneath the sacrum is now withdrawn to stabilise the pelvis on the opposite side. The corrective manoeuvre is now completed by a combination of leverage at the foot in an upwards direction on the fulcrum at the knee and a slight rocking motion. This will produce gapping strain at the sacro-iliac joint and it is only left to carry the leg into rapid extension and replace it on the table.

THE OSTEOPATHIC GENERAL TREATMENT

JOHN KEMP

Doctor Littlejohn taught that health rests on a three-pillared foundation, namely:

1. Adjustment of Structure
2. Adjustment of Function
3. Adjustment of the Organism to its Environment

The degree to which there is failure in one or more of these pillars will determine the need for and the extent of general treatment. So-called “specific treatment” is administered to a specific or localised point of maladjustment, the effects of which are confined to a localised area and tend to be acute rather than chronic. The origin of specific conditions is usually simple and “specific.” If unresolved, a condition of this nature may spread; subsidiary centres of disturbance may be established and gradually the body economy as a whole can become involved, with a general lowering of vitality. Similarly, this state of affairs can be reached gradually and insidiously as the result of failure to achieve perfection in postural growth and condition, metabolic function, dietetic habits and emotional state. Poor or indifferent health is the customary lot of such persons and it is usually accepted as being normal. The adaptability to environmental stress is impaired, resulting sooner or later in strain which crystallises into symptoms requiring treatment. This group constitutes the majority of the patients who ultimately seek help from Osteopathy. This chronic disease or illness is seen to be the result of generalised causes which are yet inter-related.

Perhaps the most important thing to realize about Disease is that it is a *negative* state; it is not a positive something affecting the body, but rather a lack or deficiency which lowers the state of health according to its degree. The purpose of the body according to Doctor Littlejohn is to act as the instrument for the expression of the indwelling Ego, functioning through what he calls “Life Force”. According to this view, the deficiency which causes lack of health and ultimately disease is in this “force” itself. Where then does this force or vital energy come from and where does it go to? The answer is that like electricity, heat, etc, it is a manifestation of the Principle of Energy, which is universal. In the living body the production and supply of vital energy normally depends, at least to a great extent, on

obtaining air by respiration, food by digestion and assimilation, and water by absorption; it is stored and distributed by the nervous system. Perfect health must therefore depend on a free, unobstructed nervous system, and also on an unobstructed arterial system carrying pure blood. All the causative factors of disease result in interference with the initiation and conduction of nerve impulses and/or interference with the quality and distribution of the blood.

The great contribution of Osteopathy to the art of healing is the discovery and comprehension of the spinal lesion as the greatest single factor in the causation and maintenance of disease. The exact way in which this operates is not entirely clear, but it would appear to act largely through reflex irritation from joint surfaces, ligaments and inter-segmental musculature. It is possible, too, that there is some element of pressure from the altered foramina of the two vertebrae in lesion. This pressure, although small, may compress the areolar tissue investing the nerve trunk sufficiently to alter the conductivity of the nerve fibres. Moreover, the altered anatomical relationship of the foraminal margins as well as of the two vertebrae concerned will inevitably result in stasis of the lymphatic fluid and venous congestion, with a corresponding change in pH toward the acid side. This pH change is believed to affect the conductivity of nerve fibres, and the tissues and organs supplied by such affected nerve roots are bound to get out of harmony with the body economy in general. Especial importance attached to any interference with arteries or lymphatics, an idea which is expressed in Dr. A. T. Still's aphorism that "the rule of the artery is supreme." The lesion provides the basis of ill-health which tends to grow into disease, or to increase susceptibility to it.

The second great cause of ill-health is connected with the quality and purity of the blood. This in turn is dependent upon a number of factors, such as the digestive and assimilative functions and the eliminative activities of the body. Digestion is performed by the mouth, teeth and saliva as well as by the stomach, intestines and associated organs. Nutrients and water are extracted from the ingested food and pass into the blood. The blood is then passed through various organs which extract certain substances and add others, and is eventually collected into the vena cava and so passes to the right side of the heart. From here it is immediately despatched to the lungs where it is in contact with inspired air, loses carbon dioxide and takes up oxygen and is generally purified and energised. It is then fit to be distributed to all parts of the body by means of the heart and the circulatory system. Doctor Littlejohn taught that the essential vital energy which he

called “life force” is stored in the nervous system and distributed by it and that the solar plexus is of special importance in this connection.

It will be readily seen that any factor which can interfere with the processes of digestion, assimilation, respiration and elimination must directly affect the health of the body either in part or as a whole. Chief among these factors is the food with which the body is supplied. The living body requires food and water to supply basic nutrients and fluid and to make vital energy available and operative. There is obviously a right balance of the necessary ingredients, a deviation from which will cause a disturbance in health, in spite of the considerable adaptability of the organism. In these days we are confronted with modern diet with such evils as artificial fertilisers, poisonous insecticides, chemical preservatives, refinement of flour, sugar, etc. There is also the danger of unbalanced food intake. Most people in our western civilization are grossly over-eating an excess of acid-producing animal protein and sugar, with an insufficiency of fresh fruit and green vegetables or alkali-producers. This, together with inadequate water drinking, leads to clogging of the bowels, strain on the eliminatory functions of skin and kidneys, with generally poor elimination, catarrh and constipation. The skin deserves some special consideration in this connection. There are about three thousand pores per square inch on the skin, through which some five to eight pounds of solid material passes daily. More often than not the patient pays too little attention to real cleanliness of the skin, causing imperfect elimination and often resulting in various forms of skin disease, and leading at best to the maintenance of a generally high level of toxicity in the body. Imperfect bowel action is obviously an important factor in production and maintenance of poor health, but at the back of it usually lies faulty feeding, lack of proper exercise and, above all, insufficient fluid intake. It is generally agreed that the body requires four to five pints in the twenty-four hours in hot weather. If the necessary amount is not supplied, the bowel is the first part to go short and the result is a costive condition or constipation.

The third great cause of ill-health and so of disease lies in the mental and emotional field. Mind appears to have a positive action both on energy and matter and “what one thinks, so one becomes.” In other words, if one habitually thinks negatively or harbours negative emotions such as fear, jealousy, envy, greed and hate, so one lays oneself open to destructive influences which produce the corresponding negative state of disease. The subconscious or instinctive mind which runs the machinery of the body and performs vegetative functions, does not reason, but it is influenced and

acted on by the thought force it receives. If, therefore, it is bombarded by negative thoughts and emotions or by two ideas of an opposite kind but of approximately equal strength, harm will be done or tension set up which may express itself in some organ such as the stomach or heart, or in the musculature, particularly of the spine. In this sort of way harmony is disturbed and ill-health and disease follow. Obviously this is a vast field which can only be touched on here.

Many different schools of therapeutics have been built up round these three great causes of disease and they differ largely according to where the emphasis is placed; there are the spinal systems, the naturopathic systems, and the psycho-therapeutic systems. A very large proportion of the patients who seek our help are suffering with bodies which are affected by one or more of these causes in greater or less proportions and degrees. These cases will generally respond best to a generalised form of treatment, the object of which is, (a) to normalise food and fluid intake and the eliminative processes, (b) to normalise structure with particular reference to the spine as the distributive centre of vital energy, and (c) to adjust the mental and emotional outlook.

The taking of the case history will reveal certain symptoms which will lead to the discovery of the centre of the spinal disturbance and, in addition, it is usual to find a number of key lesions such as C1, C4, D2, D5, D10, L2, L5, and perhaps a sacral lesion. These lesions are specially typical of the kind of case we are considering in which the three causes mentioned are operative. All these lesions should be dealt with and this should be followed by a light articulation of the whole spine and ribs, downwards if elimination needs to be stimulated. Sometimes it is preferable to do the soft tissue relaxation before manipulation, sometimes afterwards, this depending on the individual case and on whether the treatment is to be heavy or light. When the patient is in a negative state it is important to radiate health and confidence because these attributes will be absorbed by the patient and this may be the turning point in his attitude to his complaint. The importance of a positive outlook cannot be too much stressed; all healing must come from within and is a matter of consciousness. Each cell has a consciousness of its own which is under the control of the subconscious or instinctive mind. Therefore, a positive impulse through the subconscious mind must achieve a positive result and that result must be a return towards normal harmony throughout the total organism. Ill-health or disease implies a rebellion or separation of the cell consciousness resulting in disharmony. Consciousness throughout the

various parts of the body is co-ordinated by means of the nervous system and so once more we are led back to the three main causes of ill-health mentioned above.

Having decided that the patient is to receive a general form of treatment the procedure should be as follows:

A. ADJUSTMENT OF STRUCTURE

(a) General articulation to the spine and limbs. This has the effect of freeing up rigid areas and relaxing muscles and ligaments. This reduces tensions and equalises the circulation, promoting bodily harmony and well-being.

(b) Specific correction or the removal of spinal lesions after a general articulation re-establishes structural integrity which constitutes the first pillar of health.

B. ADJUSTMENT OF FUNCTIONING

(a) Work on the breathing apparatus by raising the ribs, relaxing the diaphragm, and giving attention to the lung centre, D1 to 5. Then give advice on breathing exercises.

(b) Work on the digestive and assimilative organs by giving attention to the splanchnic area, D6 to 12, and to the liver, spleen and solar plexus. Give the patient advice on diet and prescribe a "stomach bath" if necessary. This consists of drinking a wine-glassful of pure undiluted lemon juice on waking, followed by a tumbler of water, cool or hot, and by lying back in bed and shaking the stomach about.

(c) Work on the eliminative organs in a general way by attention to L2 and 3, and the sacro-iliacs. Instruct the patient in the care of the *skin* by the use of dry brushing, daily washing, stimulation by cold water, sunlight and fresh air. The *lungs* can be helped by deep breathing and other exercises and by lymphatic pump treatment. In dealing with the *bowels* adequate fluid intake and suitable diet must be initiated. The use of the enema or colonic irrigation may be necessary. In connection with the *kidneys* adequate fluid intake is again important and overstrain from excessive intake of animal protein should be avoided.

C. ADJUSTMENT OF THE ORGANISM TO THE ENVIRONMENT

(a) *On the Physical Plane.* Consider in this connection all postural strains which may be induced by sitting or standing habits; for instance the desks of children and those in sedentary occupations. (Typists seem to get a special sort of strain around D6). Give advice about sitting, stooping and turning in bed.

(b) *On the Mental and Emotional Plane.* Take note of any nervous strain which may be present and trace out unresolved problems and negative attitudes. Remember that congenial occupation leads to harmony and health, the converse being equally true. This has a bearing on psychosomatic medicine. Remember that there is a trinity of will, thought with action, and feeling. People seem to be ashamed of expressing feeling and tend to *suppress*, which may be normal, and to *repress*, which is definitely harmful and can become causative of physical disease.

(c) *On the Spiritual Plane.* Fundamentally a large proportion of the illness in the world comes from a spiritual cause outworking or expressing itself on the physical plane. Basically this implies a lack of harmony in the spiritual sphere or, in traditional language, a disharmony as between the individual soul and God. This is often due to lack of spiritual light or insight and a resulting ignorance of the spiritual laws of the universe. There is a law of spiritual cause and effect which may be summed up in the phrase "one reaps what one sows." For example, those who are harsh bring harshness on themselves and those who are loving bring love. Very often cases of rheumatism are maintained by a secret resentment against some person or against "fate." If the patient's attitude can be changed from this resentment or hate to an acceptance of the cause and effect, then the way becomes cleared of the influence which is blocking the free flow of vital energy and spiritual force, and it is possible for healing to take place. Many examples of this kind will be found in practice, but the physician needs experience and insight to be able to put his finger on hidden causes, and he must also cultivate an understanding of the spiritual laws which govern our life and their effects on the physical plane.

APPLIED MECHANICS OF SPINE AND PELVIS

STAFF LECTURE*

If a solid body is suspended, its balance is maintained at a definite point and the line of action of supporting power passes through the centre of gravity, if the body is at rest. In the human body this point is to be found in the 3rd lumbar vertebra. If the movement of the body is properly balanced its equilibrium is maintained in standing or walking around this point and is under the control of muscles and soft tissues in the dorsal, lumbar and sacral areas. In the erect posture, the pelvis represents suspension through the legs which operate as the support in relation to standing or walking. This is why the legs become tired in abnormal postural conditions of the body, and why, in its true gravital position the body is suspended from the pelvis, and supported upward from the pelvis.

The centre of gravity in the body mass is just above the pelvis, and, according to Littlejohn, this is the explanation of how and why in the maintenance of body equilibrium, the parallelogram of the thorax, and, what he calls the semi-circular parallelogram of the abdomen, balance each other in activity through the diaphragm, in all the body movements. For example, if a blow is given to the body in such a direction that its line of activity passes through the centre of gravity while the body is in a state of inertia, the whole body will be moved but without rotation. On the other hand if the line of action of the applied blow does *not* go through the centre of gravity, there *will* be rotation, as well as flexion, if the body is properly gravitated. But here the body will move as a whole and will follow the same line of action as if the force *had* passed through the centre of gravity. That is to say, the forces originating from the blow will be distributed without or with rotation, according as to whether the original force passes, or does not pass through the centre of gravity. This is why in accident cases rotation lesions are so commonly found in and around the area of the spine corresponding with the centre of gravity.

Now, although the centre of gravity is located at the 3rd lumbar the central gravity line is not necessarily a straight immobile line, and is more properly described as the resultant of the various forces which operate in the body to maintain its normal equilibrium, and it changes according to the variations of movement in the different body sections. We learn from

* This is thought to be John Wernham

this that the 3rd lumbar is the most important point in the spine, from the standpoint of mobility, and, also, that it is the most vulnerable vertebra in the spine, because the entire body above is supported upon it and the remainder of the body below is suspended from it. Also, in body movements it is (or ought to be) the most mobile point, whereas it is, in fact, most susceptible to impaction above and below. This means that here we have the seat of the commonest lesions in the spinal column, because in all the mobile and locomotive postural changes in the body, the centre of gravity is continuously trying to maintain a vertical line from the vertex of the head to the centre of the arch of the foot, and in standing or walking all movements of the body must pass through the 3rd lumbar, whatever the posture of the body may be; vertical, horizontal or otherwise.

This explains how the ribs become twisted in an attempt to compensate for spinal curvature and why we must restore the centre of gravity to its normal mobility, and the vertical gravity line to its normal postural relation to the rest of the column, before trying to correct a spinal curvature. If the head and thorax are not held in the proper position the fault is traceable either to the centre of gravity, or to the centre of gravity line. If this malposition is continued there is a secondary accommodation which will disturb the posterior, anterior and lateral condition of the lumbar region of the spinal column. This provides us with the principle that in all body mobility the rest of the spine must accommodate itself to the 3rd lumbar. If not, a compensatory curvature, or lesion will occur in this area and this is the reason why we get in most cases a posterior lumbar and an anterior upper dorsal. Note that when the centre of gravity line is mal-placed at the 3rd lumbar there is a true bone lesion which is a primary structural deformity, and where it is anterior to the articulation of 4-5D there is always a muscle, or soft tissue lesion which is the secondary attempt of the mal-poised body to accommodate itself as nearly as possible to normal activity.

ANTERIOR BODY LINE

This is the line parallel to the centre of gravity line and extends from the symphysis mentis to the symphysis pubis and is perpendicular to a line drawn across the pubic arch. It represents the line of thoracic and abdominal pressure, and operates functionally in relation to the pubic arch as a base of structure and function. If this line should fall anterior to the symphysis pubis in the changing contour of the body the pressure falls on

the abdominal walls and the muscles and ligaments of the anterior pelvis, especially the inguinal ligaments. The result is that the thorax and abdomen have a soft tissue base of pressure instead of a solid base which is the reason why the pain begins at the inguinal ligaments in enteroptosis and appendicitis. If the line falls posterior the abnormal pressure falls on the abdominal viscera and the pelvic contents, and, especially, on the blood circulating in the aortic and iliac fields. Here the thorax and abdomen are resting on a vacillating base of pressure which produces. If the line falls posterior the abnormal pressure falls on the abdominal viscera and the pelvic contents, and especially, on the blood circulating in the aortic and iliac fields. Here the thorax and abdomen are resting on a vascillating base of pressure which produces a constant irritation with reaction on the nerves, resulting in paroxysmal pain such as we find in neurasthenia.

This line then is the resultant of thoracic and abdominal pressure, and, like the central gravity line it changes its position from time to time. In the case of a posterior lumbar the centre of gravity is posterior, and we have such conditions as prolapse, hernia, round shoulders, stooping, hollow chest and what is described as T. B. pressure in the thorax, especially if associated with asthma. As we have seen the anterior line when thrown forward causes pressure on the abdominal wall resulting in inguinal hernia with strain on the cervical and upper dorsal areas, as is found in the eye, ear, nose and throat diseases. Secondary lesioning occurs at the atlas compensatory to the lumbar condition and accommodating the mobility of the upper spine to the limited mobility of the lower spine. Axis lesions of the same type may also accompany pelvic lesions if the condition travels through the anterior thorax, the clavicle and ribs one and two.

In foot troubles such as those resulting from wearing of high heels the line is thrown too far forward in relation to the pelvis and legs, giving rise to femoral hernia, prolapse usually in connection with a subsequent retroversion and retro-flexion of the uterus, and headache and weak eyes, etc., through reaction in the cervical area. In this case the secondary type of lesion is at the axis, the weak abdominal muscles transmitting their irritation through the diaphragm to the soft tissues in the lower cervical area and thus affecting the head and other parts in the facial area. All this means that the centre of gravity line and the anterior body line work together to maintain the normal poise of the body and if they are normal there is perfect adjustment of the equilibrium of the body trunk. The reaction of the extremities on the trunk in normal exercise is the normal basis for the preservation of poise, and, in so far as the two lines are co-

ordinated in activity the only exercises of value are those of the head, arms and legs in relation to the trunk of the body, and these should be simultaneous.

THE NON-PARALLEL LINES

A line drawn from the anterior margin of the foramen magnum, or more exactly the anterior tubercle of the atlas, to the posterior junction of 4 and 5L, through the body of 1S to its terminus at the tip of the coccyx represents the antero-postero line. It unites the entire spinal column from the atlas to the coccyx in one solid piece and in one articulated mechanism. It passes through the centre of the bodies of 11 and 12D, so that these two vertebrae are of importance in the anterior-superior support of the spine and body. It is for this reason that pivotal articulation in thoracic-abdominal torsion, and mechanical resistance to loss of the normal arches of the spine is at 11 and 12D. In the so-called straight spine when the normal curves are destroyed these vertebrae become impacted and tend to become ankylosed, or they may drop posteriorly and pull the lumbar vertebrae with them. It should be noted that this is the only part of the spine at which the ribs do not articulate with the corresponding transverse processes, are not united by costal cartilages and do not have inter-articulated ligaments. Mechanically the ribs are at their weakest here, while the vertebrae are at their strongest. All lateral torsion and rotation movements of the trunk of the body centre at this point, and it is, therefore, of great importance in spinal curvatures, especially of the lateral type; in all cases in which postural conditions give greater prominence to the use of one side of the body, or of one arm or leg; and in all circulatory conditions involving the blood supply to the abdominal cavity. From all this we learn why it is that the atlas coccyx line of ligamento-muscular articulation supplies the foundation of spinal movement the centre of which is at the articulations of 11 and 12D.

A line drawn from the posterior margin of the foramen magnum to the anterior margin of the articulations of 2 and 3L, and terminating at the femoral articulation in the acetabula is the postero-antero gravity line. It is complementary to the articulation of the atlas coccyx line, and indicates a line of pressure which binds the POSTERIOR occipito-atlantal articulation to the articulation of the rib with 2D, with the object of maintaining the integrity of neck tension, and, at the same time, to make the line of abdominal-pelvic support strong enough so that the articulation of 2 and

3L from the point of view of tension is always directed towards the articulation of the head of the femur in the erect posture, and to the tuberosity of the ischium in the sitting position. The special function of this line is to maintain tension via the articulatory ligaments and cartilages of the neck, trunk and legs coordinate with the pressure in the internal cavities of the body. In other words the postero-antero ligaments through the dorso-lumbar region oppose and counteract the articulations in the movements of the hips and the muscle movements of the legs, and coordinates these movements with the activities of the abdominal muscles and the pelvic organs.

A line drawn from the anterior margin of the foramen magnum to the posterior junction of the bodies of 4-5L, and passing on to its terminus at the tip of the coccyx, is called the "anterior central line." A second line is drawn from the posterior margin of the foramen magnum to the centre of the body of 4D, and from here to the centre of femoral pressure in the acetabulum. This is called the "posterior central line," and note that this line terminates in an articulation. In this case we have one anterior central line balanced against two posterior central lines, the one terminating at the tip of the coccyx, and the two terminating in the acetabula. The lines cross the central gravity line opposite 4D, the anterior position here occupied at the crossing being an articulatory support, and forming two triangles on either side of the body, one above and one below 4D. The function of these triangles represent articular tension because the termini and the crossed point are all free articulations, which means that they gravitate by articulation round the central gravity line with a free articular tension, and that having their apex point of contact and union at 4D, this is the weakest point when there is excessive relaxation of the spine and trunk of the body.

The lines cross the central gravity line also in connection with the articular function of the third rib with 3 and 4D, on both sides, and the triangles have their apex and pivot of movement at the articulation of rib 3. This means that any torsion movement of the upper and lower halves of the trunk of the body is concentrated at the head of rib 3, and any abnormal reaction between the circulation in the two cavities of the trunk, or any interference to the passage of the blood stream through the diaphragm is reflected at rib 3. This accounts for the fact that in aortic aneurysm and functionally weakened heart action, the trouble is always located at 3 and 4D and rib 3. The apex of the upper triangles is opposite 4D while the base consists of the articulating structures in relation to the bony margin of the

foramen magnum, the triangles giving support to the articulations for the head. Note that this support is not a line but a triangle and if the head is normal it is planted on the bases of the triangles and poised on their apices at 4D and rib 3. Therefore, in cases of head imbalance and headache, the best way to reach this pressure is to treat at 4D and round the basi-occiput. If the head articulations are normal, 4D is the terminus of downward pressure and lateral torsion in the head movements, and any variation in the triangles will disturb the head in its relation to the spine and trunk, the greatest strain being always at 4D and rib 3. Note also that this involves ligaments, muscles and nerves at 4D, and the viscera supplied reflexly from this point, that is, the heart, lungs and cardiac end of the stomach. It is important in curvatures of the upper spine because contractions of the chest are always centred at 4D and rib 3. The same is true in the barrel shaped chest.

The apices of the upper and lower triangles meet opposite 4D. The bases of the lower triangles are represented by the innominates, especially the ilio-pectineal lines. This gives value to the thorax as the point of basal support for the D.L. spine, and explains why the ilio-pectineal field is so important in gynaecology. Any variation of the spinal column below 4D will tend to destroy the correlation of the triangles to each other, which means that 4D is the critical point in the spine of strain, besides being the point where the heart, stomach, lungs and superficial circulation all centre. It is also the point where the phrenic and 10th cranial coming from the nervous system are centred, and where they establish their visceromotor function in relation to the thoracic and abdominal organs. At the base of the lower triangles we have the foundation for the support of the abdomen, and for the maintenance of abdominal tension, since the cavity has no encasing ribs. This is why the sacro-iliac and sacro-lumbar articulations and 5L are the three lesions in all the different forms of enteroptosis. We learn from this that the bases of the lower and upper triangles are quite different; the upper base is soft tissue just below the cranium, which, with the brain, demands a soft cushion, with free lymphatic circulation to prevent concussion and compression, while the lower triangles have a solid base in the innominates, with tension along the sides of the abdomen. That is to say the base of the triangle is solid bone while the sides of the triangle are soft and mobile muscle. This is why the play of the thorax in the rhythm of its activities depends on the muscular, ligamentous and rib action which keeps the abdominal cavity in a state of activity and elasticity, and this is how the physical action of the organs in the abdominal cavity is always that

of internal pressure, or, in other words, the intra-abdominal air pressure is negative which means that the organs in the cavity are floating and in position. In attempting to replace these organs by artificial means we must induce the action of the normal negative pressure in the cavity, and balance the correlation between the bones in the pelvis and the anterior and posterior muscles in the D.L. From this point of view 4D and its ribs is the point from which the mechanics of the spine operate to control blood circulation, respiratory activity of the thorax, and to coordinate the vital powers of the organism. Mechanically the triangles operate to maintain pressure conditions and form the base of support to the organs and the spine, which is the reason why visceromotion is the foundation of all the activities of the organs in the two cavities. Attempts have been made to explain the correlation of the organs with the spine on the basis of vasomotion, centred at 2D-2L, but from this point of view, the centre is below 2L, and is explained by the relation of the pelvis as a bone to the spinal and abdominal muscles as the sides of a triangle.

If there is any interference at the apex at 4D the disturbance will have a definite reaction either on pressure or support. Therefore in the treatment of enteroptosis we must correct the pelvic base; correct tension in the spinal and abdominal muscles; normalise 4D in position and articulation; correct thoracic tension and torsion by treating the dorsal vertebrae above 4D in relation to the articulation of the ribs. This means the establishment of free play in the thoracic tension and elasticity which is the controlling factor in the mechanical activity of the entire spine in relation to the abdominal organs.

It should be carefully noted that the 3rd lumbar has no relation to the triangles of pressure and support of the spine because it is the only vertebra through which the central gravity line passes, and is the only bone structure in the column which acts as the base for the gravital posture of the body. It is a solid and rigid point in the spinal column just as 4D is mobile and elastic. It is the only point of solid deviation from the vertical integrity of the central gravity line, and, therefore, it is the point of break in the solid continuity of the column, bearing in mind that the rest of the line is made up of soft tissues. This means that in all types of curvature the treatment must begin with the re-establishment of 3L in its normal position in the column, and its articulation in the column above and below. Any deviation at 3L which is caused by the torsion of the trunk on the gravity line, or, of the articulations at 2 and 4L will throw the burden onto the pelvis. This is why so many displacements of the pelvic organs, and so many deformities

of the lower extremities are always associated with a lesion at 3L. For example a displaced uterus, or loco-motor ataxia always have a lesion at 3L, and this is so because 3L is the support for the pelvis and legs. Physiologically, it also explains irritation in the pelvic functions of micturition, defaecation and parturition.

Therefore 3L is the centre of the visceromotion in the pelvic field, and, indirectly, of visceromotion in the entire abdominal field, just as 4D is the centre of vasomotion, and its extension in the superficial circulation, in the correlation of the circulation in the two cavities of the body and in the correlation of the deep and superficial circulation all over the body. That is to say the 3rd lumbar is the centre of visceromotion, and if a visceromotor trouble exists, attend to 3L first. On the other hand, 4D is the centre of vasomotion, and if a vasomotor condition exists, attend to 4D first.

THE CURVED LINES

The mechanics of the triangles as applied to the spine represent the key to the erect posture, but we must remember that the posture is not maintained in a state of equilibrium. The body is a moving structure and if the erect posture is to be maintained a new factor must be introduced to control and balance. This new factor is found in the curved lines. From the point of view of gravitation the body is a unit, but, now, it is divided into sections corresponding with the grouping of the vertebrae in their curves, and the grouping of the centres in the cord. Therefore the value of these curved lines is the regulation of the distribution of circulation and nerve and brain energy in connection with the mobile changes of the erect spine.

The curved lines are represented by the arches of the column, and they have no relation to the anatomical curves; thus the upper arch extends from 7C to 8D. It is the dorsal curved line of the column and is directed posteriorly to the perpendicular line, the point of greatest deflection being the articulation between the bodies of 4 and 5D, so that the keystone of the dorsal arch is the articulation between 4 and 5D. As the body is always resting downwards gravity determines its force and energy downwards, and in connection with the head and the upper part of the trunk this is centralised in the dorsal arch. In this sense the arch is a kind of mobile antagonism between the head and the upper part of the thorax on the one side and the spine on the other. This explains how the superficial circulation and the rhythmic action of the heart and lungs are controlled

from this point in the spine; it explains the function of the upper triangle as a support to the head and as a protection for the soft brain substance within the cranium, to prevent concussion. Lesions which involve the equilibrium of the head and neck begin at 4D, and will also involve the vertebrae just below.

The two forces above and below this point on either side of the gravity line act and counteract on each other with a force and pressure which is always at its maximum, if normal, posteriorly. This means that in the normal, the head, neck and shoulders are constantly being pulled backwards by a force which is greater than that pulling anteriorly so that the point of greatest pressure in the upper arch is at 4D.

THE DORSO-LUMBAR ARCH

This arch extends downwards from 10D through the sacrum to the coccyx and is directed anteriorly to compensate for the posterior maximum force in the upper arch. From the tip of the coccyx to the centre of each acetabulum are two lines which join with a line drawn between the two acetabula to form the basal triangle. This is a solid bone structure welded together with ligament and muscle, which, in the tonic state, is capable of supporting the entire body weight; the head is supported on the upper triangle, balanced on the apices of the lower triangle, and supported at this base. The weight of the trunk with the arms is supported on this base, just as the legs are suspended from this base. This means that the base is triangular in shape and is a fixed point, and any interference of the relations between the legs and the trunk, or with the balance of the trunk would be felt along the line between the acetabula which is the original cause of all sacro-iliac lesions. The reaction from this primary disturbance occurs along the lines from the acetabula to the coccyx which is the path of the disturbance passing from the legs through the sacro-iliac to the sacro-lumbar articulations.

In the lumbar the keystone is between the articulating bodies of 2 and 3L, and is a mobile articulation as we found to be the case in the upper half of the spine. It depends for its regulation on the action of the basal triangle and it is a point of great strain in the spinal column because the mobile mechanism of the body depends on this point for a base of support. It is the point of greatest strain just as the greatest point of stress is at the articulation of 4 and 5D, and explains why we have so much pain in the small of the back when the body is subjected to strain, whether this comes

from the legs, arms or head and neck. The 3rd lumbar is the vertebral point through which the centre of gravity line passes: that is to say the centre of the lower half of the trunk is located at 3L, and is a solid point. The accommodating point is at the articulation of 3 and 4L, and when the body begins its activity the strain is removed from the body of 3L to the articulations of 2 and 3, and 3 and 4L, and, therefore these are weak points in the spine. These are the reasons why so many lesions in the lower part of the back are located either above or below 3L. As the anterior and posterior gravity lines and the triangles formed by these lines move round the central gravity line, which is the axis of movement, there are certain definite locations for primary lesions; these occur at the occiput, 4 D, 3L, and the sacro-iliac articulations. This is the basis of the equilibrium of the body in which the spinal column is the axis, and the correct body poise is maintained by adjustment in relation to its strong and weak points. This adjustment occurs through the body lines and triangles rather than through the spinal column, so that the individual vertebrae and groups function, not in relation to the column, but in relation to the body lines and triangles.

The weakest point for stress in the column is at 4D, that is the inter-articulation between 3 and 4D, and 4 and 5D, with the articulation of rib 3, both anterior and posterior in the thorax. The weakest point for strain is at 3L, the articulations between 2 and 3L and 3 and 4L, and as there are no ribs here to carry the stress in the strain, the condition settles in the muscles in this area as "lumbago." Subordinate to these are weak points located at 7C and 9D. When pressure or strain tend to produce a posterior displacement of individual vertebrae or break the balancing function of the arches in the column the stress will settle down at 7C or 9D. This results in the separation of 7C and the break-up of the cervico-dorsal enlargement. In the case of 9D the vertebrae is forced into combination with that above or below. This suggests that if we wish to correct a 7C or a 9D lesion, we must first remove the stress by correcting the strain in the spinal column which has produced it. Contrasting with these weak points we have a strong point at 5 and 6D and a strong group unit area extending from 5D to 2L. This is a double arch of which 9D is the keystone, and, unless each vertebra above and below 9D is articulating properly the arch is weak and not strong: that is to say the strength of this combination of articulated structures depends on the inter-articulation. It must be noted, however, that in this powerful unit area there is a weak inter-current point at the articulation between 11 and 12D. The term inter-current is used because this is a continuous arch.

This is the area, also, in which the mobile and semi-mobile ribs are located and any strain in this area will tend to centre in ribs 6-12. This is the basis of the 5th rib lesion in asthma which centres in the lower thorax, and in which there is immobility in the upper thorax, limited mobility in the diaphragm and hyper-mobility in the abdomen. This is the point in the spine which affects the trunk circulation below the diaphragm via the aorta; it also represents the arterial side of the intestinal and pelvic circulations, and the mesenteric circulation which is the largest venous blood field in the body. These are the reasons why 11D is called the Haemorrhagic Centre, and why it is regarded as a point of such special importance. It must be added, however, that stress at the Haemorrhagic Centre falls back on 9D as the centre of strain, and this is why we inhibit between 11 and 12D to control haemorrhage, followed by articulation upward as far as 8D.

The weakest point in the spine is the articulation between 2 and 3L. This is so because the entire body above this point is built on the support of 3L, while the entire body below this point, that is the spine with its musculo-abdominal case plus the pelvis and legs, is suspended from the articulation of 3L. This implies solidity above 3L but a mobile articulation below 3L, and that the articulations of 3L should be both elastic and mobile. Above 3 we have the unit area which is the basis of the solid structural integrity of the column, while below 3L in the normal there is elasticity and mobility. This is why it is so important to clear up impactions in the lower lumbar before trying to establish structural integrity in the column above 3L. In a child when the lower lumbar remains posterior and becomes rigid the upper spine always tends either to an antero-lateral, or lateral displacement. It is said that diabetic conditions will often develop in such a child because in the reaction of the lumbar region to the upper column the point of strain centres at 9D which is in relation to the circulation to the kidneys and the lower urinary tract. The 5th lumbar is also a weak unit in the spine because it unites the flexible column above with the solid sacrum below and, where the sacral resistance is too great, elasticity throws the strain on to the sacro-iliac articulations. Here we find a tendency to stress in the form of a displacement of 5L in which the body of the vertebra yields to pressure and which is further exaggerated by weakening of the articulation between 4 and 5L, and 5L and sacrum. This is why in correction of the pelvis and spine, the sacro-lumbar and the sacro-iliac articulations, must be co-ordinated.

In point of fact there are three points in the spine which have free articular mobility. In the cervical area this is at 4-6, and we must pay attention to any rigidity here when correcting the neck. 11D-2L is an important area in the field of nutrition and rigidity here is characteristic of anaemia. The lumbo-sacral articulation is the foundation of free sacro-iliac movement, of freedom in trunk movement and in relation to the legs, and on the mobility of this area rests the articulatory relation of the entire spinal column on the sacral base. In gynaecological cases it is a weak area in the spine, and we find impaction of 4 and 5L with a posterior D-L and in the treatment of a condition such as dysmenorrhoea there must be correction of the lumbo-sacro-iliac combine. It regulates the entire circulation of the pelvis from the visceromotor point of view rather than the vaso-motor and we look to the splanchnics for compensation at 6-12D. In gynaecological cases compensation travels upwards rather than into the legs and we get either a rigid, or hyper-mobile condition at 9-12 D in which there may be diaphragmatic tension reacting on the upper abdomen and causing disturbance of the stomach, liver or spleen, or reaction may occur in the thorax in which case there is relaxation below rib 5 and rigidity above rib 5 with hyper-mobility in the lower D and diaphragm. Here there is generally an asthmatic complication.

The treatment should begin by lifting up the two legs backwards to produce relaxation in relation to the pelvis. Then with the patient on the side and the operator standing in front, the legs are flexed on the abdomen and the pelvis is lifted upwards and forwards, while the pull and push movements are applied from 4L to 9D. Then with the patient prone apply arm leverage to relax the upper thorax from rib 6, and repeat articulation downwards in the prone position. To complete the treatment have the patient sitting and flex back as far as possible to overcome the posterior lumbar condition and apply diagonal rotation to the spine fixing the thumb on the opposite side of the spinous process.

FIRST EXAMINATION OF A PATIENT

Let the patient stand easily and note the position of one foot with reference to the other; the position of the hips with reference to the line from the hip to the shoulder joint. Note if there is any difference in the length of these two lines and how the shoulders are held when the arms are hanging straight down or raised forward above the head. Note the position of the head and neck with reference to the trunk, especially the posterior

muscles on the two sides of the neck as the patient rotates the head slowly each way. Then ask the patient to sidebend the head and neck as far as possible and watch how the opposite shoulder rises, and how the trunk plays at the two hips. Tension at the hip on the opposite side may cause spasm or cramp in the leg. The best sitting position is on the stool with the feet resting on the floor and the hands on the knees. The feet should be three or four inches apart so that the femora are parallel to give the normal attitude. This position is the best for the examination of 2-8D. It brings into prominence the trapezii, latissimi and serrati muscles. The trapezii and latissimi work in opposition, the one in contraction, and the other relaxed, unless the spine is abnormal (2-8D). The serrati act first as mediators, and then co-ordinate and balance these opposing activities, so that the serrati are really in control, and we have here, in the normal, a united muscular activity which is of importance in vaso-motion in the heart, lungs and stomach, because the control in the interscapula area is in the muscle rhythm.

A similar function is discharged by these muscles in relation to the circulation and rhythm of the heart, the rhythm of the lungs and the activity of the pulmonary plexuses, these activities depending on the muscle control of the spinal nerves at 2-8 D. The nerve supply to the stomach, liver, intestines and spleen is primarily sympathetic via the solar plexus, which is the centre, while the interscapula muscles control visceromotor for all the organs in the body. Thus, in heart and lung conditions the vertebrae and their attachments from 2-8D are always involved, while in cases involving the stomach, intestines, liver and spleen, the ribs and attachments are in lesion. This gives us a clear line of distinction between a vaso- and a visceromotor, disturbance. The commonest type of lesion in this area is a lateral curvature, either right or left. From this we get a neck lesion condition which irritates the vagus, or a physiological reaction via some of the organs irritating the phrenic nerve. This is another important differential point here between the acute neck lesion of the convex type and the chronic lesion neck of the concave type.

POSTERIOR AND ANTERIOR CURVATURES

Anterior curvatures always affect, or show primary disturbance in, the abdominal organs, while posterior curvatures affect, or disturb the thoracic organs. This is important because tension terminates in the ribs in the anterior curvature, and in the vertebrae in the posterior curvature. In the

anterior type the reactionary disturbance is transmitted to the abdominal organs through the sympathetics, whereas in the posterior type the disturbance is transmitted to the thoracic organs through the central nervous system. This gives us yet another differential point in the thoracic and abdominal diseases; that the primary control, and loss of control in the abdomen is sympathetic, and in the thorax it is of central nervous origin. The starting point of a lateral curvature is the movement of an individual vertebra brought about by a weakening of the articulations, and this occurs most commonly at 3, 5 and 6D. In the 3D lesion we find the two forces of pressure above, and suspension below, so that the best way of dealing with this lesion is traction applied from 2-5D. In the 5D lesion the rib is the primary factor, it being the rib which determines all visceromotion in the thorax, as in asthma. The lesion at 5D is the result of this modified visceromotion, which becomes vaso-motor by reaction. Therefore in a 5D lesion we should first get some movement in the 5th rib. In the 6D lesion there is primarily a break between 5D and 6D which divides the dorsal into two parts, and the result of the weakening of this articulation is that the dorsal area is divided by reaction above and below 6D. This gives the clue to the treatment which is by articulation from 3D down to 6D, and from 9D up to 6D.

If we describe a lesion as the physical weakening of an articulation, and if we remember that, physiologically, there are two motor nerve supplies to one sensory nerve supply, then we would expect any disturbance to fall on the weaker side of the nervous system, which is sensory. This is why lesions are sensitive and tender. This is why the spinal lesion is generally from 1-3 vertebrae above the physiological centre of the organ involved. For example, the centre of distribution for the heart is at 4 and 5D, and the corresponding ribs, which gives us rib 2 as the typical lesion in angina pectoris. 3D has been described as the "lateral posterior apex" of the dorsal arch, and, for this reason, is the weakest vertebra in the upper dorsal spine. This is why we find so many posterior lesions at 3D, the anterior lesion, if it exists here, is secondary to disturbance of the lower D, L or pelvis, or to some organic condition which is centred in the nerve supply at 3D. The 5th dorsal vertebra is also a weak point in the spine, but this is not from the standpoint of the arch, as in 3D, but is due to the weakness of the 5th rib and the first change is a weakening of the articulation between 5 and 6 D in which there may be a tilting of 5. Sometimes the articulation is broken when the vertebrae operate more individually, the 5D tending to move anteriorly and 6D posteriorly. The starting point of the break is usually in

rib 5 which tends to bulge anteriorly thus marking a posterior subluxation of the rib with the result that 5D tends to fall away anteriorly by compensation, and rib 6 is twisted upward and thrown out posteriorly. Correction should reverse the order of production: that is, the 6th rib, the 5th dorsal vertebra and the corresponding rib.

From the point of view of mechanics the upper arch of the spine extends from 6C to 8D while the lower arch extends from 10D to 4L. This means that 9D is lying between the upper and lower arches, and that 5L lies between the lower arch and the sacrum, normally articulating, as it does with the sacrum to complete the basic foundation for the spine in the pelvis. Therefore, 9D and 5L are inter-articular points in the arch movements of the spine, and when the arch becomes subnormal there is a tendency to rigidity below 9D, and impaction below 1L, the impaction always beginning at 4 and 5L. This is why we emphasise the importance of articulation as the best method of treatment to establish co-ordination between the groups of vertebrae or in any changes involving the arch movements. For example, if we have a lesion of the 3rd dorsal the only method of correction from the point of view of mechanics is to correct the cause that weakens the upper dorsal arch, that is the lumbar region, and the articulatory relations between the lumbar and the pelvis and the legs.

When the arches of the spine are disturbed typical lesions occur at 3D, anterior or posterior; 5C anterior; 9D posterior; 5L anterior, or postero-antero. If the primary lesion is in the sacrum then the 5L will be postero-antero, but if the primary lesion is in the lumbar area then the tilting at 5L will be antero-postero. It is important to remember that in correcting this type of lesion we must deal with the arch, and not with the individual lesion, on the basis of arch relations. From the point of view of the individual vertebra these lesions occur only when the arch inter-articulation is broken, unless displaced by trauma. 9D, 5L and 5C are involved because they are articulating pivots between the arches, and as such they indicate variations in the positions of the arches.

In treatment, therefore, we correct the individual lesions by treating the arch as a unit, and then correcting the inter-relation of the individual lesion to the corresponding arch. The principle of treatment then is to correct the position and the relations of arch to arch, so as to be able to correct the inter-arch vertebral relation. 3D is an individual vertebra. It is the centre of the cervical-dorsal arch and of thoracic movement, and it is also the pivotal point in the spine with reference to the centre of the gravity of the

body and any change in the gravity may return through the diameter of the body to the 3D. We should look for two points in treating the 3D. The condition of the spine in relation to the centre of gravity line, that is the perpendicularity of the spine from 3D, and the relation to the sacrum, which means that the treatment should begin at the sacro-iliac articulation and move upwards through the sacro-lumbar. 3D lies just above the keystone of the upper arch and we should try to round out the arch by articulation, and, as it involves the support of the spine, articulation should be given downwards from the lower C through the upper arch.

8D is at the terminus of the upper arch and is atypical when it is abnormal in articulation. In the normal posture the upper part of the body moves on the lower, and 8D is the pivotal point of this movement so that the movement of the two halves of the trunk occurs on 9D as a base. Where there are rotation lesions these often occur first at the 8D because all movement from above occurs downward to 8D and the best method of articulating the 8D is in connection with diagonal twisting of the entire body trunk with the patient sitting. Leverage may be applied to the upper or lower half with fixation at 9D.

In cases where only part of an arch is involved the whole arch must be articulated, with the ribs in order that the unit condition may be established. In the neck 1 to 4C is a unit, 5C articulating alone between this and the lower unit which extends from 6C-8D, the lowermost group extending down to 4L. When a single vertebra is in malposition the group vertebrae are liable to be kept in malrelation by the action of the single ones which are to be found at 5C, 3D, 9D, and 5L. In trying to correct any lesion we must get back to its cause. For example, if there is a lesion at 3D after making specific correction, the entire spine should be articulated from the primary area to the secondary lesion area. If the cause is traumatic try to repeat the movement that caused the lesion. In a 5D lesion correct the rib first, because the function of rib 5 is underlying the articulation of 5D. Then articulate the vertebrae above and below and then articulate rib and vert. one after the other. The procedure is similar in the case of a 6D lesion as the lesion is caused by rigidity between 5 and 6D. In a group lesion at 7 and 8D there is always some pre-existing weakness which is either a yielding of the vertebrae above with a background of a 5th rib lesion, or of the lower half of the upper arch, especially when it is secondary to a posterior lesion at 9D. This should be corrected first before attempting to correct 8D and this means the establishment of normal relations in the two segments of the spine from 8D up and 9D down.

A persistent type of lesion is a chronic backache, a dull ache, in the lumbar, lumbo-sacral and sacral-iliac regions. In some cases there is inguinal pain, in others bladder pain, both of the visceromotor type. In other cases there is a pseudo-sciatica in one or both legs the pain being intensified by stooping forward or flexion of the thigh with the knee rigid. The pain is aggravated by standing, relieved by lying down, but is worse in the morning due to the prolonged lack of movement. With the intensified pain produced on forward flexion, especially if this is on one side, the body is kept immobile in walking, with tension on one side of the trunk. The rigidity then passes to one side of the abdomen and the corresponding innominate, finally settling on one side of the body. In walking the body moves with a semi-circular rotation of one side, while the other resists the movement. The result is strain of the neck and head, diagonal strain across the pelvis, rigidity in one of the sacro-iliac joints and finally, the shortening of one leg, in which the pain settles down in the calf, or foot. To deal with the lack of uniformity in movement on the two sides of the body, place the patient supine and loosen with arm leverage, beginning with the side that drags. Then with the patient sitting, articulate upwards from the lower D until tension at the pelvis has gone. Follow with head movement in all directions and with the patient prone relax the spine from below upwards with leg leverage, using the short leg first.

The general type of backache results from trauma, overstrain, lifting, or the unequal use of the two sides of the body. The resultant inco-ordination settles down in the sympathetics or parasympathetic, that is in some organ of the body, or in the sacro-iliac or sacro-lumbar area. The patient feels as if the spine above 5L were isolated from its base, and every movement is a lifting up of the spine and trunk and a kind of throwing of the legs and pelvis. If the condition settles in the central nervous system, the weakness occurs in a group area of the spine, as in lumbago, or in the dorsal area, when the chest becomes contracted, and, on walking, the chest is thrown up and out, the movements of the abdomen and legs becoming isolated. Various lesions will be found but these are secondary and must not be treated specifically until the primary condition is corrected. The group lesions indicate that deviation has occurred from the central gravity line and does not involve the weight line. The centre of gravity line is the key to all the supporting structures of the body and spine in the erect posture, because the tension and tone of all the tissues, and the balanced relation between the tissues, depends on this line. There are five landmarks with which the centre of gravity line must be compared and which mark the co-

ordinating sections of the spine and trunk in relation to the entire body in the erect posture. These are the posterior margin of the spinous processes of 7C and of 5L, the median line of the great trochanter, the posterior margin of the head of the fibula and the posterior margin of the external malleolus.

The spine is a scaffolding upon which are built all the body cavities, and to which are attached the arms and legs. It is made up of moulded and super-imposed osseous segments. All the spinal deformities arise from some perversion of the skeletal structures and may occur at some specific vertebral point, or at two separated points in the spine, the separation being represented by the group lesion. In the normal spine there are three natural curves which are formed by the neck arch, the rounded back and the compensatory arch in the small of the back. Deformity in these may have a secondary effect by reaction on the organs, but it will always occur by what is a lateral movement through the ribs or muscles attached to the vertebrae. The three posterior landmarks and points of comparison to check for deviation from the normal are at 7C, 9D, 5L. The ventral landmarks at these levels are the anterior neck; a curving line towards the anterior body surface, and from 9.D towards the level at 5L.

The normal erect posture is a properly balanced anterior-posterior body which depends on the posterior muscles, and is maintained anteriorly in relation to the centre of gravity line. This means that the physiology of the body balances the physical tonicity of the superficial tissues, and that the rhythmic condition of the entire body, both internal and external depend on physiological stimulus. Therefore the normal status of the body is the net result of the antagonistic play between the dorsal muscles, and the superimposed structures between the dorsum and the ventral parts of the body; that is to say the ribs and the intercostal muscles. It is suggested that the most prominent lesion in backache is the muscular strain in this part of the spine, and that relaxation and tonic treatment of these muscles is the best palliation for the backache. In the so-called broken arch of the foot the line of body weight is thrown forwards and produces the increased strain on the supporting tissues upon which the foot arch depends, that is the long muscles and tendons of the leg. The rounded shoulder is not a local condition of the shoulder, or dorsal spine or thorax, but is rather the attitude of the entire body and its resultant effect on the upper part of the spine, the fault being in the attachments of 5L to the pelvis as a whole. Similarly, abdominal visceral prolapse is not a local condition but is

secondary to the loss of key tone in the soft tissues anterior to the vertebrae 9D to 5L.

The centre of gravity line demands the continuous tonic action of all the posterior muscles and where there is anterior displacement of the line there is a greater demand on the muscles to maintain the erect posture resulting in strain or backache. If the condition is prolonged there is muscular spasm and ligamentous strain. The cause of the anterior displacement of the centre of gravity line is general muscular relaxation, postural hyper-relaxation and tired weak back. The abdominal and pelvic organs become weakened by reaction in neurasthenia and the patient stoops forward to relieve the pressure or tension. Further reaction occurs in the cerebellum with compensation in the eyes, ears and general muscular system, and in the semi-circular canals with compensation in the ears, mouth and the lymphatic system. Secondary reactions from the central nervous system appear as fits or convulsions, centring in the tongue, eye or throat. There are always resultant modifications in the skeletal adjustment, in the thoracic cage, in the abdomen, or in the walls of these structures. There may be modification of the postural curves in the erect position.

In the posterior displacement of the centre of gravity line there is diminished muscular strain and the shoulders and hips are displaced backwards, when other conditions are normal, the greater displacement of the pelvis giving rise to an alteration in the spinal curves, and producing an inclination of the spine from its base which throws the weight of the body trunk forward and causes strain on the posterior muscles in the lumbar and pelvis. When these muscles become tense the sacro-iliac articulations become weakened because no compensation is provided, so that the nervous reaction is peripheral rather than central, with spasmodic contracture of the peripheral muscles, which, however, does not relieve the original tension in the ligaments, fascia or connective tissue but settles in the soft tissue in the area of the sacro-iliac articulations. These articulations become abnormally relaxed thus throwing more work on the posterior muscles, while the overstrain causes tension on the ligaments in the sacro-iliac field, and those functional disturbances so often found at the sacro-iliac without any modification of the joint.

Lateral curvatures or lateral group lesions such as we find at 4-5D, 8-10D, 2-3 L, 5-6 C and sacrum (when alone) are the causes of back strain, and often explain the shortness of one leg when there is no leg, or hip or pelvic lesion. These lateral groups are at the foundation of one-sided

movements of the trunk in relation to the legs. In gynaecological cases it is the explanation of the one-sided pain in the inguinal area, or in the hip and leg. Here the original disturbance is the hyper-relaxation in one sacro-iliac and its soft tissues; in the posterior muscles of the back, on one side; at the centres of the arches, especially 4-5D, and 2-3L, with pain in the articulation; and also at the junction point of the arches, especially 9 D and 5L. The primary cause may be intra pelvic or intra abdominal with a background of sympathetic irritation, visceromotor in origin; or it may be rigidity in the spine at the points mentioned or sometimes it is a combination of both. In the first case the condition generally arises from congestion and enlargement of organs or neoplasm; here the posture is modified to diminish pressure in the cavity involved, and this is why we find hardening of the posterior muscles and an increase of fascia in the lumbo-sacral region in the case of a pelvic tumour.

The treatment of choice is traction-extension of the whole spine plus articulation to overcome the tense muscles and rigid ligaments and thus allow the vertebrae to assume the normal posture. Like the brain, the lungs and the kidneys, the pelvic area is defective in vaso-motion, and too much local treatment will only irritate, and the only way we can reach congestion, inflammation or accumulation in the neoplastic field is to deal with the disturbed condition of the general blood supply.

This should be followed by postural correction giving particular attention to three points in the spine: (1) 4 and 5 D with the ribs, also including rib 6 which is generally involved when the spine is unbalanced; (2) 9D and ribs 9 and 10. These represent the balanced relation of the splanchnic nerves through the diaphragm as the base of the thorax, the diaphragm operating rhythmically to maintain the balanced movement of the thorax, and also the peristaltic action of the abdominal organs, via the suction and tonic action of the abdomen through the abdominal recti muscles; (3) Through the 3L with reference to the muscular and ligamentous attachments to the pelvis and legs and the control of the dilator side of the blood circulation. When these three conditions have been corrected the strain will be relieved and the abdominal organs can then be replaced by an uplifting movement employing suction through the abdomen as a whole, and lifting the organs, if necessary from the iliac fossae.

RECAPITULATION

First, correct the posture of the spine and body as a whole. Postural integrity and the maintenance of the body as a whole depends on the balance, and proper correlation of all the structural units within the body, and it is only upon this normal body adjustment that the organic adjustment can be built. Abnormal reactions in the articulations are usually more general than specific even if a condition begins in a single structure: no body structure stands alone. In the average case exercises should not be prescribed until there is sufficient correction to allow the muscular system to be used without strain. Physiological recumbency at night and change of posture during the day to energise muscles which are not involved and reduce the activity of involved muscles to a minimum will rest the exhausted muscles. Passive articulation should be given to correct the structural defects, but not too frequently. The patient should be encouraged to apply some active exercise to assist the correction and when tonicity begins to be established the patient should exercise to maintain the correct posture. These exercises should not be too prolonged; maximum stimulation is reached in five minutes after which the muscular response weakens and there is a fatigue reaction.

The body is built entirely on mechanical lines and hence any maladjustment of structure represents not only a mechanical deviation from the normal but an irritation to the standard body condition. On the other hand the mechanics do not necessarily indicate the extent of functional modification, which may depend on the area in which the alteration occurs and whether it is vital to body mobility. Nature adjusts mobility and structure in order to correct resistance, correlate normal and abnormal and balance tension by relaxation. These deep-seated maladjustments call for correction but the lesion is not so much a maladjustment of structure as a maladjustment of functional activity outside the limits of physiological and anatomical mobility. In other words, the lesion is one of restricted or modified physiological activity resulting in malposition, the lesion being the end product of these combined conditions. In the first instance the maladjustment exists within the range of normal physiological and rhythmic mobility of the body, the variation from the normal being a compensation, or a compensatory maladjustment, to provide a defence in the organism against improper and irregular activities. In either case there is a reversal of physiological movement and to correct this we must retrace the path of lesion development in order to

establish the normal physiological mobility, and to correct the articular relations of the structures involved. This implies that we must find the exact position and condition of the structures in lesion, the extent of the malposition and the amount of abnormal reaction. We then use the local structures and forces within the limits of the physiological movement plus the mechanical forces necessary to correct the position of the structures, and to adjust these structural activities to one another. This indicates that all corrective types of movement must be rhythmic both with reference to the postural position of the body, and to the articular relation of the individual structures.

THE MECHANICAL PRINCIPLES INVOLVED IN THE PRODUCTION AND CORRECTION OF SECOND DEGREE LESIONS

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Every material object is subject to the action of the laws of gravity. It must and does find material support directly or indirectly by the earth, water or atmosphere. That support may be either through compression members or through tension members which provide support through other compression members.

The body and its parts is subject to the same laws of gravity as inanimate objects. Each bone of the osseous framework has its foundation upon which it rests or from which it is suspended. These are subject to variation according to the position of the body, whether standing, sitting or lying. The assumption of the upright position by man has thrown a delicacy of balance upon the structures of the vertebral column that calls for the co-ordination of a multitude of organic structures – bony, ligamentous, muscular and fluid – through the adaptation of all of which the erect position is maintained.

To the osteopathic physician, the study of the physics of the spine is of more than passing interest; for his concept places upon structural integrity the responsibility for functional normality not only in the immediate structures themselves, but the function in distant but organically associated parts. Both etiology and therapy are related in osteopathic thought to the degree of perfection in the functioning of the individual articulations, particularly those of the spine.

The foundation for the spine as a whole is the pelvis. The support for which, as a base, is a horizontal line passing through the acetabula in the standing position and through the tuber ischia in the sitting position. The sacrum is suspended between the innominates and becomes the direct foundation for the vertebral column while each vertebra rests upon the one immediately below as its supporting foundation.

There are three major independent supports for each typical vertebra. They are the inter-vertebral disc with the pulpy nucleus as the weight bearing, portion of it and the two articular facets. One, two or three of

these may serve as weight-bearers at any one time according to the position of the vertebra with reference to its foundation.

This three-point support constitutes a weight-bearing tripod subject to the physical laws governing the tripod as a weight-bearing instrument.

The first law of the tripod is that it provides stability with flexibility of movement.

The second law of the tripod is that when all three legs of the tripod function in a weight-bearing capacity the superimposed weight may be moved only with difficulty with reference to the foundation.

The third law is that the same is true with reference to the superimposed weight moving relative to the foundation when two legs of the tripod are weight-bearing.

The fourth law of the tripod is that when the superimposed weight is carried by one of the tripod it may be moved relative to the foundation with comparative ease.

It is interesting to note in the development of the spine and the ossification of the vertebrae that in the preparation for weight bearing we find three points at which ossification is first manifest, the body and each of the articular facets (1) corresponding to the weight-bearing structures supporting the tripod.

A typical vertebra moves with reference to the foundation about certain axes both in the horizontal (or near horizontal) plane and the vertical (or near vertical) plane. There are four axes about which movement takes place in the horizontal plane: two transverse, one through the pulpy nucleus and the other through the articular facets; and two diagonal, one on each side passing through the articular facet of that side and the pulpy nucleus of the intervertebral disc; there are three vertical, one through the pulpy nucleus and one through each of the articular facets.

Movement about these seven axes provides the flexibility exhibited by the general movements of the spine described as flexion, extension, sidebending and rotation. Flexion, extension and sidebending occur by movements about the horizontal axes, while rotation takes place about one or more of the vertical axes singly or in succession. When the rotation takes place about a vertical axis there is a faulting (to borrow a geological term) of the other two axes as represented by a straight line passing through both foundation and the vertebrae representing the weight borne by the tripod. When the weight comes to rest on the tripod with the two vertical

axes faulted and a secondary rotation occurs about one of the vertical axes represented by a faulted axis, the legs of the tripod represented by the axes which are not weight-bearing at the time of the rotation are faulted. Then when the tripod comes to rest on its foundation all three vertical axes will have been faulted. The result is immediate restriction of motion, just as with a three-hinge door when one hinge is thrown out of alignment and the movement of the door is restricted because the vertical axis about which the door rotated has been faulted.

With all three axes faulted and the vertebra at rest upon its foundation, it remains in this position until by a reversal of the laws by which the axes were faulted (and the super-imposed weight carried to an abnormal position) the axes of rotation are corrected in the reverse order from their production (and the vertebra or the superimposed weight, is carried back to normal relationship with the foundation).

A vertebra which has been rotated about two vertical axes in succession is designated a second degree (not a secondary) lesion while a vertebra which has rotated about but one of the vertical axes is designated a first degree lesion. First degree lesions are easily corrected – in fact will correct themselves, with the normal movements of the body. Second degree lesions will not correct themselves nor will normal mobility of the articulation be present until the vertical axes of rotation have been corrected. When a second degree lesion of the usual type (without organic complications or resident pathology in the articulations other than the soft tissue tensions and degenerations incident to the faulting of the axes) occurs, the evidence points to its production in this manner:

First, there is a flexion of the spine with the weight carried on the forward leg of the tripod or the pulpy nucleus, then a rotation occurs about the vertical axis passing through the pulpy nucleus; next comes extension of the spine with the weight borne on the articular facet on the side to which the rotation occurred. With the weight borne on this leg of the tripod and with a gaping articular space on the other side, the weight tends to swing about the facet in contact with the foundation as the axis, and the body of the vertebra is carried to the same side of the median line as was the spinous process during the production of the first degree lesion. With the weight supported on the two articular facets and a release of extension the vertebra comes to rest upon its foundation with all three vertical axes of rotation faulted; with tissue tension upon all of the ligaments joining the vertebra, with the superimposed weight out of balance on its foundation;

with characteristic change in relative position to its foundation and with areas of disturbed sensitivity represented by the tension on the surrounding tissues which are under tension. It is interesting to note the immediate relief of sensitiveness due to relief of tissue tension when the law of the tripod has been applied to the lesion for the correction of the faulted axes of rotation. Distant symptoms secondary to circulatory and nervous disturbances occasioned by the tissue tensions are often almost as prompt in responding to the realignment of the vertical axes of rotation as is the local sensitiveness from the tissue tension.

The articular facets in the different regions of the spine differ in position, the direction of their articular facets, and in function, yet the law appears to hold as applicable throughout the spine. The atlas and the occiput are subject to the law as well - only the tripod is reversed, the two articular legs being in front and the third leg posterior suspended by the ligamentum nuchae. With this concept the law is made applicable to these articulations as well as the others of the spine.

The pulpy nucleus is by pressure the densest portion of the intervertebral disc and is the weight-bearing portion of the disc, the balance of the disc evidently serving a balancing and cushioning function.

Motion about the pulpy nucleus when freed from weight bearing is something like that which occurs when the hand is placed on a full hot water bottle a roll over the pulpy nucleus without actual separation of the opposing surfaces of the bodies of the adjoining vertebrae except to relieve the weight-bearing which is shifted to the articular facets under conditions of extension or extension with sidebending.

The position assumed by the vertebra in the first degree lesion is that of rotation about the vertical axis passing through the pulpy nucleus, throwing the spinous process to one side of the mid line. The position next assumed by the vertebra when there has occurred a secondary rotation about the vertical axis passing through the articular facet on the side toward which rotation has occurred, is for the body of the vertebra to move toward the side of lesion, the spinous process to move back from the first degree position toward the median line and the transverse process on the side of lesion to be prominent posteriorly, while the tip of the spinous process is anterior and slightly to the side of lesion with reference to the tip of the vertebra below. This gives the characteristic picture of the lesion which was early described as an 'anterior lesion' but which has been more recently described as an 'extension lesion'. When by a shift of the sidebending from

the side to which rotation took place in the primary lesion to the side from which rotation took place and the weight is borne on the articular facet from which the rotation took place, the body of the vertebra will be carried to the side of lesion, the transverse process will be prominent on the side to which the rotation first took place in the production of the primary or first degree lesion, and the spinous process will be carried backward, producing a posterior lesion or a flexion lesion according to other terminology.

The tissue changes about a lesion have been studied carefully by the workers of the Research Institute and their findings would seem to fit accurately into the findings with this concept of the mechanics; for certainly the faulting of the vertical axes of rotation could not take place without producing tissue tension and following the abnormal tension degenerative changes in the connective tissue would logically follow.

Degenerative or accommodation tissue changes as well as infection and the results of abnormal pressure on the structures involved may so complicate the structural mechanism that corrective movement in accordance with the law of the tripod may be restricted or impeded altogether; yet preliminary treatment under such conditions is often effective in providing sufficient movement in the articulation so that the faulted axes may be corrected in accordance with the laws of the tripod.

The position of the patient during the treatment or attempted adjustment is immaterial, although the sitting posture has been found the most convenient in most instances. The essential point is to so visualize the parts and the faulted axes constituting the lesion that the law of the tripod may be applied in whatever position the patient may occupy.

The physiological movements of the spine are apparently in harmony with the law of the tripod. It is only when the normal axes of rotation have been faulted either within or without the physiological limits of mobility that we have the condition of lesion in the osteopathic sense.

The articular facets on the vertebrae above in the dorsal region are placed along the arc of a circle which is smaller than the arc of the circle along which the superior facets of the vertebrae below are placed, so that following flexion with the weight borne on the pulpy nucleus the articular facet on the side to which rotation is made bunts the superior facet of the vertebrae below while the articular surfaces of the corresponding facets on the opposite side 'gap' from being moved apart. This, under the usual mechanism of lesion production, causes the facet in contact to become the

leg of the tripod around the vertical axis of which the rotation takes place, accompanying the production of a lesion of the second degree.

The surface findings in a second degree lesion are very definite, due allowance being made for deformity and deflexions. In the usual type there is a break in the normal conformity of the spine antero-posteriorly. Most frequently there is a forward 'sag' in the spine at the point of lesion. The spinous process appears forward on the vertebrae below; the tip of the spinous process slightly to the side of lesion and the transverse process prominent or posterior on the same side as that to which the spinous process has rotated. Tenderness is most pronounced on the side of lesion both over the spinous process and over the transverse process.

In the first degree lesion the spinous process will be lateral with reference to the vertebrae below and the transverse process will be prominent on the side opposite to that to which the spinous process has moved.

The landmark for the transverse process in the dorsal area is that it may be found opposite the second interspinal-process-space above the spinal-process tip in lesion.

Correction of second degree lesions by the application of the law of the tripod, by working to retrace the steps by which the lesion was produced, may be accomplished without applying any degree of force except that necessary to secure the rotation about the vertical axes of movement as the superimposed weight is rotated about the legs of the tripod in succession. No thrust is given to traumatize the tissues, to cause the patient pain, and to biologically embarrass the structures.

To describe in detail the technique employed in correcting a hypothetical lesion in the mid-dorsal, for instance, the fifth in second degree lesion to the right, the procedure would be as follows: With the patient seated on the treatment table or stool, the first procedure is to study the landmarks and confirm the diagnosis. In a typical case, without deformity of the vertebrae, the dorsal curve would be slightly flattened at the tip of the fifth dorsal. The tip of the fifth dorsal would appear anterior and slightly to the right of the sixth dorsal spine. The transverse process of the fifth would be prominent on the right (the same side as that to which the spinous process is deflected). The transverse process on the left would be anterior with reference to the transverse process to the sixth. (The landmark for the transverse process in this region, you will recall, is opposite the second inter-spinal space above the tip of the vertebra in lesion). There is usually a

tenderness both over the tip of the spinous process and over the transverse process on the side toward which the vertebra has rotated.

For the correction, the patient being placed near the end of the table or on a stool, the physician standing at the left side of the patient supports the weight of the body above the lesion by reaching under both forearms of the patient with the left arm, then places the thumb of the right hand on the articular facet of the fifth (midway between the transverse process and the spinous process). Pressure is made at this point so that after extension of the dorsal spine and sidebending toward the left has been accomplished, the corrective rotation of the fifth may be carried out first by the rotation about the vertical axis passing through the left articular facet. With the weight thus borne and the spine thus supported by the thumb, rotation is made away from the physician to carry the body of the vertebra (which is to the left of the sixth) back to mid-line, correcting the faults in the vertical axis passing through the pulpy nucleus. Extension and sidebending are then released and the weight of the fifth allowed to rest on the pulpy nucleus by forward-bending of the patient with flexion of the dorsal spine.

This releases the posterior legs of the tripod from contact with their base and permits by a reverse rotation (the thumb of the right hand having been transferred from the articular facet to the tip of the spinous process) allowing rotation around the vertical axis passing through the pulpy nucleus. This corrects the faults in the vertical axes passing through the articular facets. The flexion of the spine is then released and the vertebra comes to rest on its foundation, the sixth, with the faults in all of the three vertical axes corrected. This is of course assuming that local tissue abnormalities have not developed which would interfere with the application of the law of the tripod to the lesion described.

BASIC LINES AND THE THEORY OF THE TRIPOD TECHNIQUE

J M LITTLEJOHN

The primary base line in all spinal movements is the ground level; there are two secondary base lines depending on whether the patient is standing or sitting. In the standing posture a line drawn through the two acetabula forms the secondary base line whether the legs are normal or not; in the sitting posture the secondary base line is a line drawn between the tuberosities of the ischia. In the normal subject the antero-posterior plane of the entire spine should be perpendicular to both of these base lines at their mid-points. The sacrum being the first bone in the perpendicular mid-line is therefore the foundation on which the entire spine rests. Hence, in correction of any spinal lesion the balance of the sacrum determines the anatomical relationship of all the structures which rest one on another upward to the head. Therefore, in examination of the spine the sacrum should be examined first and every other test considered in relation to the sacrum. The function of the sacrum in relation to the spine is that of equalisation-it acts as a kind of shock absorber for all the upper sections of the spine. The sacrum itself is also balanced by the two innominates. The mechanics of the movements of the sacrum and the two ilia depend on the articular movements of the hip joint and the muscles around it and on the degree of movement in the sacro-iliac field. The most common lesion of the sacrum is a rotation forward and downward, both these movements taking place in relation to the innominates on one side or on both. The innominate on the affected side is posterior in relation to the sacrum both at the superior spine and at the tuberischii, the sacrum being rotated forward and downward on the side of the lesion.

When we speak of a displaced innominate, the abnormal movement is really in the sacrum. Thus in correcting we follow exaggeration of the innominate displacement by corrective movement to the sacrum. The sacrum is held in its normal position by three supports, two of which are ligamentous, and the third bony. The bony supports are the articular surfaces of the sacrum and the innominates, so that the bone support in the sacro-iliac articulation is that of compression. The ligaments on the other hand, furnish support to the articulation by tension, the sacro-iliac ligaments being the most important, and therefore bearing the greatest part of the weight. The other element of the ligamentous tension is supplied by the sacro-sciatic ligament and it operates by keeping the lower end of the

sacrum from tipping upward and backward on account of the weight carried by the upper and forward part of the sacrum in relation to the fifth lumbar vertebra. From the physical standpoint tension operates as the result of weigh-bearing in both cases. The rotation of the sacrum forward and downward in relation to the innominate is, therefore, with the sacro-iliac ligament as a tangent in reference to the arc of movement described by the sacrum as it is held in balance between the sacro-iliac and the sacro-sciatic ligaments. The lumbo-sacral articulation exhibits the principle which applies to all vertebrae below the atlas. All these articulations rest on a three point support (tripod principle), each vertebra supplying the support for the next vertebra above. The three points of support are the two articular facets, which are the accessory supports, and the centre of the disc which is the main support. The pulpy nucleus of the intervertebral disc thus becomes the centre of all movement between vertebra and vertebra. Accordingly, the law of movement is that the weight is always borne by one leg of the tripod. This indicates the only way in which the relationship between foundation and weight may be altered.

If two legs of the tripod are in contact with the foundation, movement on that foundation becomes difficult, except in connection with sidebending. When the weight is balanced on the supporting point movement is free in flexion and extension. The variation from the normal in movement always begins in sidebending, varying from slight to very great. This accounts for what has been called "rigidity" of vertebral articulations, the rigidity always implying some modification in the behaviour or condition of the inter-vertebral disc. In the case of a lesion the tripod principle applied to the bone structure of the spine furnishes the mechanical basis on which correction can be made. According to this principle a lesion may be produced by the weight being thrown onto one of the three supports to the exclusion of the others, this being followed by a rotation round the accessory legs of the tripod as the axis, while the weight remains supported on the one leg. This means that in production of the lesion there is first of all a forward bending or flexion movement throwing the weight of the vertebrae above onto the centre of the inter-vertebral disc, followed by a rotation of the vertebra in relation to its foundation around the leg of the tripod which bears the weight (i.e. the disc) until the articular facets are in contact on the side towards which the rotation is made. This we call a lesion of the first degree (extension-rotation-sidebending).

To correct this two things are necessary: (1) Extension, to lift the weight from the single leg, and (2) Rotation, in the direction opposite to that

producing the original rotation with fixation applied at the side of the spinous process of the vertebra on which the weight rested. If the spine is extended the weight will be supported on the articular facet in contact, and the upper vertebra will get a two legs support, while the rotation will cause the other facet to swing forward so as to receive contact with the second facet on the foundation, and the body of the vertebra will rotate towards the side of the articular facet in contact in the original lesion, this facet becoming the axis around which the corrective action takes place.

When extension and articulation take place there is a slight sidebending movement of the upper vertebra and the body of the vertebra will come to rest with all three legs in normal position. But if the extension and sidebending movement exist without rotation then the vertebra will come to rest on the three legs in an abnormal position. This is the type of lesion which is difficult to correct except by the application of a reversal of the law of the tripod which caused the lesion. The chief sign of this secondary lesion (flexion-sidebending rotation) is that the spinous process appears anterior, slightly to the side of the vertebra below, while the transverse process is posterior or prominent on the same side. This means that in locomotion the body of the vertebra has moved to one side, thus favouring one side of the body at the expense of the other in order to make the spine comfortable.

In correction of this type of lesion we must bring the weight of the upper vertebra of the two involved to the leg of the tripod represented by the articular facet on the side of displacement. This is done by a two-fold movement, i.e. extension of the spine with fixation of the under vertebra, then slight sidebending to the same side followed by rotation of the body of the vertebra to the opposite side with the extension maintained. This procedure requires to be repeated until the vertebra rests properly on the three legs of the tripod. The next step is to release the sidebending in extension and then to flex the upper vertebra on the lower until the weight is carried by the intervertebral disc. There are some cases in which this second degree lesion becomes so complicated by the soft tissue lesions that it is not possible to correct it without resort to yet another technique. Here we use the thrust with the object of relaxing the soft tissues around the lesion field by shock. When the thrust has liberated the bone or bones involved it is generally much easier to apply simple rotation under extension, the rotation being given in both directions laterally.

These principles of the tripod apply to all the vertebrae from L5 to the atlas. In the case of the occipito-atlantal articulation, however, while the same principle of movement applies there are only two compression points represented by the articular facets, and the third leg of the tripod is represented by tension in connection with the ligamentum nuchae. This means that instead of the pressure being in the intervertebral disc (as in the vertebrae below) it is divided into two and rests on the facets making the supporting points forward or anterior. The third supporting point or leg (ligamentum nuchae) is posterior. This means that the tripod between the occiput and atlas is the reverse of that between all the vertebrae below. Thus, the posterior lesion of the atlas is the first degree lesion, and the anterior lesion of the atlas is the second degree lesion. In correction of both these types of lesion flexibility must be induced in the whole spinal column in order to obtain relaxation of the ligamentum nuchae. When this has been done the same principles as before are applied in correction.

These principles can also be applied to the ribs with the exception of the eleventh and twelfth. The tripod is here represented by the articular facets at the head of the rib and at the costo-transverse articulation and by the junction point of the rib with its costal cartilage. Taking these three points as the basis of support for the rib above in relation to the rib below, the principles applied in correction are the same as with the vertebrae. Thus fixation is always applied to the under rib, extension is applied with the patient on his side (lesion side up) and the arm is pulled above the head. Rotation is applied by leverage of the arm in a downward circular or semi-circular movement and by the leverage of pressure between the head and costal cartilage end of the rib, with a flexion movement applied to the trunk of the body by placing the knee at the vertebra corresponding to the rib.

OSTEOPATHIC DIAGNOSIS

STAFF LECTURE

Physical examination should be based on inspection of the patient as he sits, walks and moves the body. The colour of the skin is important. We find pallor in exhaustion, cyanosis in circulatory imbalance, especially on the venous side, and pigmentation in the secretory disturbances. Chlorotic conditions give a greenish tint to the skin, and Icterus the yellow discolouration which may be accompanied by a subcutaneous dropsy, if the liver condition has become established as an excretory as well as a secretory disturbance. The mucous membranes should be examined. Here we have the breaking up of the membrane in anaemia, the coated condition in all the catarrhal disturbances, the hardening and lumpiness found in the secretory disorders.

In palpation there are three points to be considered. (1) Soft tissue contractures in the spinal area. This always indicates deep seated involvement of the nerve centres. (2) The surface temperatures. These are the so called hot and cold spots which are of value because we know when these are present that the febrile process is in its second stage and is capable of preventative treatment. (3) The vertebral column. This is the ultimate testing point in osteopathic diagnosis. We should note in connection with this that structure and function are interdependent in the developed body, because each tissue and organ has a certain degree of inherent or automatic capacity in which the fully developed sympathetic nervous system functions, and which is regulated and balanced by the central control. This differentiates structural and functional disease. In origin, the functional disease is concerned with this automatic capacity, it involves the sympathetic nervous system, and it is the field of hyper-physiology in the pathology of the various types of disease. The structural disease is found when the local disturbance reacts on the body through the spine and this is why the articular lesion in the spine becomes important.

Every normal tissue has a characteristic feel of its own, and in palpation we take note of tone, tension, mobility, elasticity, resistance, flexibility and extensibility in the various tissues. We pay particular attention to the bones because every mechanical operation in the joints of the body has its terminal point in a bone, and, we have to be concerned with leverage, muscular and ligamentous activity, and especially fascial conciliation as it

moves on the bone, as an articular unit, and with a definite system of activity.

Every articulation expresses the dynamic forces of the body, and every lesion has a conscious, as well as a physical and bio-chemical reaction. It must be emphasised that in palpatory diagnosis it is not sufficient to palpate a suspected lesion, or local part of the body, but we must be able to determine how the structural lesions of fascia, muscle, tendon and ligament unite with the bone. Not only is the framework of the body a mass of articulations, but the dynamic forces are all operating together to keep the soft tissue mechanisms in their normal condition, if normal, and in their abnormal condition, if abnormal. The foundation of our treatment rests in our ability to use the adjusting capacity of the body on the basis of mechanics plus vitality, but, while the model of the body is uniform there are variations in the tissues and organs, and, in our diagnosis it is essential to assess these variations and make them the basis of corrective treatment. They have to be considered in the light of the age of the patient, the nutritive condition, or the cultivation of a habit. This means that position, change and the reaction of time, are the chief factors that make tissues and organs susceptible to disease conditions.

With the patient in a standing position the feet should be pointing forward with the heels slightly apart. If the left foot turns outwards we may suspect a convexity to the right in the lumbar area of the spine, with a slight convexity to the left in the dorso-lumbar, to the right in the upper D with elevation of the left shoulder. Convexity is to the left from 6C down to 3D and to the right in the upper C. There will be tension at the left hip in the sartorius muscle. If the right foot turns outwards then these conditions are reversed. If the left foot turns inwards there is a concavity to the right in the lumbar area, to the left in the D-L, to the right in the D with depression of the left shoulder, to the left in the C-D and to the right in the C. The tension here is in the belly of the sartorius, with a greater tension at the origin and insertion of the adductor magnus on the femur. In the case of the left foot turning outwards there is a tendency to a straight spine, the right convexity in the C and the tension in the L being maximal, while the inward turning of the foot causes the spine to lose its normal curves, tending to kyphosis, left lateral curvature with a dropping and rigid left shoulder.

Now with the patient sitting on the stool the head is moved slightly forward to show the approximations, separations and lateral deviations of

the spinous processes. Tenderness on palpation will indicate weakness in the articulation. The patient should now sit erect to show the relation of the scapulae and the development of the latissimus dorsi and trapezius. The patient's right arm should be pulled upwards and across the chest to stretch the latissimus dorsi and bring into prominence the first four ribs. Then with the patient's hands resting on his knees pull the scapulae apart to palpate the angles of the fourth and fifth ribs and to reveal spots in connection with the lungs pleura and stomach. In this position the intercostal spaces are tender in pleuritic conditions. Follow this by bending the spine backwards and forwards noting the relation of each vertebra with the fingers, and any muscular incoordination. Then with the spine in the normal position move the head slowly backwards and forwards and quickly backwards. From this position rotate the head slowly noting the actions of the muscles of the head and face, and watch for lesioning at 3C which will show under this movement.

Examine for muscular tension with the patient prone. Give light inhibition with percussion down the spine with one hand, and palpate the muscles on either side with the other hand. Give strong inhibition to the lumbar and sacral areas. To examine the muscles in the side-lying position commence with the left side, because, as a rule the right side muscles are most developed and the patient is usually easier on this side. Inhibition should be applied to the underside of the spinous processes and if the muscles yield it is proof of contracture, whereas unyielding rigidity is due to toxæmia, and indicates the presence of metabolic wastes which must be eliminated.

In the examination of the thorax and abdomen begin with the patient prone. Place the thumbs and wrists together and throw the fingers over the thorax and inhibit the spine as if pressing a ball on a table to get an elastic rebound. If the spine is rigid the inhibition should be converted into treatment and applied to each vertebra separately. The same method is applied to the sternum with the patient supine, taking care to work downwards to avoid upsetting the lymphatic system. Relax the abdominal muscles with the knees in the flexed position, and if the abdomen is hypersensitive palpate smoothly using the whole hand. When palpating the thorax pay special attention to the five lower ribs; rigidity here will obstruct the respiration. In the side-lying position use the ball of the fingers to examine the spinous muscles and not the tips which may irritate the tissues. The fingers are pushed into the spinous processes working from above down and the process is repeated for the intrinsic muscles along the spine.

These are the deeper layers upon which the superficial layers depend to keep the spine and ribs adjusted. In order to relax, the vertebrae should first be articulated and the spine stretched to separate the spinous processes, using arm leverage and pull and push with the patient on the side. In the supine position place fingers on the heads of the ribs and elevate the arm as before. There is often a lateral subluxation of the rib head, and hypersensitivity here indicates a sympathetic visceral reflex. Hyperaesthesia at the angles of the ribs points to an upward or downward rotation; if there is tenderness at the spinous processes, an anterior or posterior lesion is indicated. If there is pain instead of tenderness or sensitiveness there is a typical spinal lesion, which may be anterior, posterior or rotatory.

For the neck examination, the patient is supine without a pillow except in goitre or heart conditions. The palpation is confined to the transverse processes with their tubercles as guides. In the normal the transverse processes of the atlas are between the mastoid processes and the angles of the jaw. Lesions are not anterior or posterior but always involve a twisting movement and if sensitiveness is present it is usually on the side that is twisted posteriorly. Bi-lateral sensitivity indicates strong contracture of the muscles attached. Axis lesions present rigidity and are sensitive at one side. The most usual site of lesion in the neck is at 3C, and is usually sufficiently twisted to make the surfaces of the articular processes palpable, the sensitivity again being due to the tense muscles.

When examining the thoracic cage inspect the interrelation of the ribs. Note the spacing by lifting the patients arm at right angles to the body and press upwards at the angles of the ribs with the fingers of the other hand. To obtain maximum relaxation the patients legs should be flexed. Palpate the costo-chondral articulations and use percussion over the heads of the first four ribs to test for mobility. Sometimes the 10th rib is in fixation or it may become loose and floating, or it may approximate to the 9th rib and press on the spleen.

In order to test the upper and lower extremities the patient is placed in the supine position. Having noted the length of the legs and the position of the feet, flex and rotate the legs and note if the ilia are uniform, the action of the leg muscles, the pressure under the great trochanter and the action of the pelvic nerves under pressure. The wrists and ankles should be extended to find the degree of rotation; the radius and ulnar, or tibia and fibula may be approximated and rigid, or they may fail to articulate through

separation. In the foot the astragalus is the pivotal factor and the movement should be tested by extension of the heel and rotation of the foot. Palpate each finger and toe with finger and thumb under extension plus rotation.

DIAGNOSIS OF SPINAL CURVATURE

This condition is most common in the female sex between the ages of 5 and 21 years. With the patient prone apply wide adhesive tape down the spine and mark the spinous processes with ink and then draw the normal sagittal line on the tape. This will provide a permanent record of the patient's condition at the commencement of treatment. Now record the physical conditions such as the nutrition and development; the colour of the skin and respiration; the condition and position of the heart with the pulse rate; vision and hearing; deportment, condition of feet, length of legs, the shape of the torso and the manner of dress, especially how the underclothing and hosiery are supported. Every one of these conditions is likely to be affected by a spinal curvature. Note the posture when standing, sitting and walking. Standing in front of the patient examine for general symmetry, shoulder and hip levels, while from behind look for the area involved in the curvature as a whole, that is the "high sides," the position and distance from the spinous processes of the scapulae and whether the head is sidebent or rotated. From above the patient check the planes of the shoulder and pelvic girdles. To test if a curve is permanent or not instruct the patient to bend forward from the standing position, first with the feet together and then repeat the operation with the feet wide apart, and finally, with the patient in the prone position. If a curve is functional the "high side" is on the side of the concavity, and the curve will disappear when the trunk is in the flexed position, or when the patient is prone.

Structural curves always indicate changes in bone structure. The patient is usually weak and presents exaggerated antero-posterior curves. In functional curves the vertebral bodies rotate towards the concavity, while in structural curves they rotate to the convexity which is the high side, the concavity being on the low side. If there is a curvature without a high side we may suspect the transitional stage in which the vertebral bodies are in the process of turning to the convexity. Remember that bone is plastic and changes to the functional demands, and that according to Wolff's law "Every change in the form and function of the bones is followed by definite changes in their internal structure and secondary alterations of the external

conformation.” At the apex of a curvature the bodies become wedge-shaped, the spinous processes deviating to the concavity in the lumbar, and to the convexity in the dorsal. On the concave side the ligaments are thicker and shorter while the muscles show fibrous degeneration. On the convex side the ligaments are stretched, thin and ultimately atrophied, the muscles also showing thinning and wasting. In long standing cases the ribs on the convex side become more angular, more oblique and are spread further apart. The scapula is thrown back and appears to be longer than its fellow. On the concave side the angles of the ribs are less, the shafts are more horizontal, closer together and show an increased curve. There is less deformity in the lumbar scoliosis the chief signs being the larger hip and deeper waistline on the concave side; displacement of the hip on the convex side; the “high side” is on the convex side, on which the diagnosis is based. Rotation in the lumbar is secondary to the sidebending and is rather less than rotation in the dorsal. Therefore lumbar curves are more severe than appears superficially.

The dorsal scoliosis shows the most marked deformities. In cases where these are convex to the left the thorax as a whole is displaced to the left, and the left arm hangs further from the side than the right arm. The waist line is flattened on the left and deepened on the right. Secondary effects include anaemia, diminished lung capacity, heart displacement and hypertrophy, venous dilation and visceroptosis. Physiological curves partially immobilise the spine, and they may be in sidebending or rotation. The long functional curve extends from the upper dorsal to the lumbosacral joint, is due to faulty posture and is commonest among females aged 20 to 40. This type of curve does not remain so for very long periods but soon develops into S curves, or even triple curves. For example, to face forward in the standing or walking position the pelvis and legs, or head and neck, turn slightly to the right, and the patient unconsciously turns the part most easily moved such as the shoulders, the right being elevated and rotated anteriorly, the left being depressed and turned backwards. The vertebral bodies rotate from right to left producing a curve which is concave to the left, the high side being on the concavity, while the curves are to the left in the dorso-lumbar and to the right in the upper dorsal. Strong contracture of the muscles on the concave side may cause something of the double curve to remain in the prone or flexed position but while it is still governed by muscular contracture the curvature is functional and not structural.

Joint surfaces are liberally supplied with sensory nerve endings and when abnormal relations are set up by bony lesions a simple reflex arc comes into operation giving rise to irritation to the nerve endings. Efferent fibres then carry the impulses to the viscera and the deep muscles. innervated from the lesioned segments, the larger skeletal muscles and limbs being less involved owing to the developmental conditions of the spinal centres. The lesion also causes local oedema which brings about pressure on the nerves in the intervertebral foramina, particularly in the thoracic area. The medullary sheath protects the cerebro-spinal fibre from pressure and the juices of the acid tissues, but the fine calibre and lack of any sheath in the case of the sympathetic fibre offers no such protection so that the viscera are affected most severely by the lesions. The small deep spinal muscles are affected less severely, while the large superficial muscles show serious effects only rarely. If the arms and legs are affected by spinal lesions it is the trophic vasomotor nerves which are more usually the primary factors rather than any direct pressure on the nerve fibre.

In lesions of the mandible pressure from the oedema is exerted upon local nerve trunks and nerve endings. The centre for salivary secretions is near the terminal nuclei of the glossopharyngeal nerve, and the mandibular branch of the trigeminal nerve. Saliva is reflexly secreted by sensory impulses via these nerves excited by taste or other sensations, or the basal ganglia may affect the saliva through fear. It cannot be controlled by voluntary action, the cortical neurones affecting the local centre through the sight, smell, chewing and tasting of food. In the laboratory human saliva was collected for 15 minutes; the mandible was then lesioned and the saliva again collected for 15 minutes; finally after releasing the mandible a third collection was made of the saliva. In 35 such experiments the flow of saliva was doubled, the output being rapidly returned to normal after correction. The aminolytic power was lessened by the lesion and its normal was not restored, even at the close of the test. The buccal membranes became hyperaemic but this condition soon disappeared when the lesion was reduced.

Experimental lesioning of the atlas produced similar effects whether the mal-positioning occurred on the left or right. These effects are dilations of the blood vessels of the mucous membrane of the conjunctiva and the nasopharynx; the tonsils, cerebral meninges and ears. There is also dilation of the pupils, increase in saliva and contraction of the cervical muscles. Other effects were reddening of the nasal, buccal and conjunctival membranes; headache, irritability, irregular respirations or more frequent respirations.

Mental symptoms were those of dullness, drowsiness and lethargy. The upper four cervical lesions are so closely related anatomically and physiologically that separate study is difficult. It is freely supplied by the ophthalmic division of the 5th cranial nerve. The 11th cranial supplies the trapezius and the sterno-mastoid muscles, and the diaphragm is supplied by the phrenic. These muscles are especially subject to abnormal reflexes, the contractions following viscerosensory impulses from some visceral pathology. Lesions in this area disturb the circulation in the head and the secretions of the glands of the head, face and neck. Oedematous pressure and chemical changes in the fluid affect the sympathetic ganglia in the vicinity of the lesion.

Lesioning of the third cervical induces inequality and dilation of the pupil of the eye, the side towards which the lesion turns being the most affected. There is also dilation of the vessels of the conjunctiva, nasal, buccal, and pharyngeal membranes, the thyroids and meningeal blood vessels. The cervical muscles are contracted and there is cardiac involvement. Clinically there is immediate discomfort, increased respiration, flushing and nausea. Patients with atlas or axis lesions may be unable to hold the head comfortably without turning or depressing the face. This lowers the liminal value of neurones concerned with emotional states and they are apt to be treated as if guilty so that the conduct modifies accordingly and he may rebel and show excessive egotism. The lesion effects from 5 and 6 C are intermingled. There is always dilation of the nasal and buccal membranes, thyroid, larynx and trachea, or vaso-dilation of the meninges, the frontal sinuses and the conjunctiva. If the cervical muscles contract there are cardiac and respiratory irregularities. These symptoms also occur with lesions at the 7 C and include vaso-dilation of the upper lobes of the lungs, the tonsils, and pain in the arms and shoulders. The heart beat becomes regular after a time and this is followed by increased sensibility at 3 and 4D. This means that we must be careful in making a diagnosis in cardiac arrhythmia and remember that the original cause was primarily at 7C.

In the upper dorsal area 1-6D are intimately related having cells which are grouped and spindle-shaped thus intermingling at different segments. Ocular symptoms arise from symptoms at 2D although the cilio-spinal centre includes cells from 6C to 4D and eye troubles may arise from lesioning at 1-5D. These segments are affected by somatic sensory impulses in which there is dilation of the blood vessels and pupils resulting from irritation over the lower cervical and upper dorsal areas of the spine.

Visceral sensory impulses exert a slight effect from the red nucleus, and the related ganglia, thus bringing the cilio-spinal centre within control of the emotional state, such as tears and dilated pupils in anger. The cilio-spinal fibres leave the anterior root of the cord with the white rami of 2-3D, enter the sympathetic chain, pass direct to the S.C.G., and innervate the blood vessels of the orbits, the tear glands, non-striated muscles of the eyebrows, pupil dilators and the capsule of tenon. Lesions are usually to the right side and the effects occur in the following order - 2D, 1D, 3D, 7D, 5D, 6D.

Cardiac symptoms may be caused from lesioning in the area 1-7D, although this occurs most particularly from 4D. Centres for the cranial blood vessels are in the grey substance of 1-4D, the axones passing mainly by the anterior roots, and thence via the sympathetics to the S.C.G., or the cranial ganglia, especially the carotid plexuses. Axones are also distributed with branches of the carotid arteries, and with cranial nerves to the blood vessels of the cranial sutures. Vasoconstrictor control of the salivary, buccal and pharyngeal glands is in the upper dorsal, principally at 2D. Certain emotional states depend on changes in the cerebral circulation and vasomotor disturbances may be responsible for hysteria, abnormal sleepiness and other emotional conditions giving rise to irrational conduct in people otherwise normal. Bony lesions may also cause altered blood pressure, affect mental efficiency and the emotions. Patients become irritable and uncomfortable after the occurrence of a lesion at 2D.; they become slower in answering questions or solving problems, and are more apt to blunder. The normal mental control is resumed after correction in a short time which varies according to the period of the lesion from a few minutes to several hours. The sympathetics are affected to a less extent by the oedema resulting from cervical lesions, and giving rise to similar results while lower D lesions may also affect the sympathetics to cause increased blood pressure and changes, in the internal secretions. Abnormal muscular reactions in the upper dorsal and slight malpositioning of the vertebrae from 1-5D, and also the hyoid bone affect the pharyngeal and laryngeal tissues. Emotional states are sometimes responsible for dilation of the blood vessels in the cervical and upper dorsal areas, the laryngeal tissues and the thyroid glands. The third dorsal is especially concerned with the tissues of the neck and throat, and the immediate effect of lesioning, which includes the 2, 4 and 1D in this order is a slight paling of the mucous membrane followed by engorgement, leading to connective tissue overgrowth, increased mucous, degeneration of muscle fibres and gland cells and hyperplasia of lymphoid tissues.

The cardiac centres extend from the first to the sixth dorsal, but more especially at the 3rd and 4th. Inhibition of the vagus nerve may result from oedema in the neck, thus increasing the work of the heart and initiating efferent nerve impulses which react on the vagus, vaso-motor and spinal centres and result in diminished blood pressure, increased activity of the vagal centres and reduced activity of the spinal centres. These compensations are rarely exact and we may find an irregular pulse with irritability of the heart and haemic murmurs, sometimes leading to the danger of a wrong diagnosis of valvular disease of the heart.

CLINICAL TESTS

Lesions produced by pressure upon the spinous processes of 3, 4, 5 and 6D caused the blood pressure to drop 10 to 25 mm. within ten minutes, resulting from vaso-dilation over a considerable area. The pressure became normal after correction. The respiratory changes are constant in type, but are variable in degree. Vaso-dilation of the pulmonary blood vessels facilitates oxygenation of the blood and diminishes respiration. Central stimulation causes contraction of the pulmonary blood vessels, reduces oxygenation and increases activity in the respiratory centres.

Lesion reaction at 5–10D involves the relations of the greater splanchnic, through which many spinal centres are associated, governing the stomach, pancreas, spleen, gall bladder, liver and the upper parts of the small intestine. The gastric centre is located in the grey matter of the spinal cord at 7–9D, and, to some extent the neighbouring segments. Impulses from the entire digestive tract affect the activity of the stomach, partly from direct splanchnic reflexes, and partly by a more indirect route through the sensory fibres of the vagus, and the descending fibres in the cord to the gastric centres. Somatic sensory impulses from the tissues innervated from 7–9D also affect the gastric centres. The gastric musculature is usually atonic when the abdominal and spinal muscles are atonic. Either may be primary, or both may be secondary to a common cause; under certain conditions impulses from the medullary and pontine centres affect the gastric centre, and descending impulses from the red nucleus and related centres also affect the gastric centres, as is shown by the digestive disturbances which follow certain emotions.

Changes in the quality of the blood flowing through the gastric centre will affect the activity of its cells. Stimulation to the centre where the circulation has been shut off, or where the CO² content is above normal

will not give the same effect as in the normal. These changes in reaction can also be observed in the walls of the stomach group. Lesions at 7-9D are mostly associated with dilation of the stomach, atony of the gastric walls and hypochlorhydria. Individual lesions give rise to gastritis and hyperchlorhydria but, if the condition persists there will be adjacent lesioning which will be followed by the atonic state as in the group lesion.

Twenty patients suffering from gastric disturbance had lesioning of the 10th dorsal. The emptying time of the stomach was increased, the H.C.L. being greatly diminished. The immediate effects of lesioning from 5-10D include dilatation of the blood vessels of the stomach, enlarged spleen, accumulation of gas in the intestine, within the folds of the mesentery and the omentum. Temporary experimental lesions in the splanchnic area gave rise to lowered blood pressure, diminished pulse, drowsiness, noises of gas in the stomach and intestines, slowing of mental processes and sometimes nausea. It is said that the spleen exerts a certain influence upon the abdominal blood pressure and supply. Lesions of the vertebrae and ribs and abnormal contractions of the muscles innervated from these segments are associated with abnormally large spleens. Nerve impulses to the liver affect the secretion of bile and the glycolytic and glycogenic functions. The spinal hepatic centre is affected by digestive and other viscera, by descending impulses from the medullary centres, the red nucleus and associated basal ganglia. This is shown by the action of the muscular walls of the ducts carrying the bile, and may be observed in persons who have suffered the storms of anger, fright or abnormal excitement. The spinal centres which govern the circulation and secretion of the pancreas are located in the lateral horns of 9-10D. There is no evidence that the cells forming the centre extend above or below, although it is impossible to define the exact limits of the spinal centre. Lesioning of 10D is commonly found in the diabetic patient and, it is of interest in this connection, that improvement follows correction of such lesions. Pancreatic changes in patients with 10D lesions also affect nutrition.

The small intestines receive impulses from the greater splanchnics and the vagus, although this is not concerned in the mid-dorsal lesions. The character of the reaction at these centres appears to respond to the nature of the blood flowing through them. Similar results are found in the viscera and at the nerve endings which seem to be specially concerned with the CO² content. Irritants and poisons also affect the spinal centres so that, although we can estimate the ultimate effect of a given lesion, we must

remember that there can be modifications due to the blood changes and the vagal activities.

The second dorsal is one of the most important centres in the spine. The lesion may be either rotation, or what Littlejohn calls "lateral rotation tilting." In rotation, when the body of the vertebra is rotated to the left the spinous process is to the right which means that the rotation is on a vertical axis. In normal lateral movement and in lateral curve of the dorsal spine, sidebending is primary and rotation is secondary. The movements are similar from 7C to 11D without reference to the cause except that with the 2D the primary movement is that of rotation. It is for this reason that primary lesions produced by trauma settle here, often involving the *rotatores spinae*, the *multifidus* or the *semi spinalis dorsi*. Ninety-five per cent of 2D lesions are primary. If the lesion is secondary it is compensating for lateral lesions at 7C or 3D. Group lesions of the upper dorsal usually begin at 3D because the 2D is affected by itself.

To diagnose this lesion place the patient on the stool and with the arms crossed over the chest, flex the head strongly to observe the deviations of the spinous processes. Where the movement of 2D on 3D is diminished or lost ask the patient to turn the face rapidly left and right, uncross the arms, place the fingers between the S.P.'s. of 2 and 3D and flex, extend and rotate the body. These movements will indicate the degree of immobility present. If the lesions are secondary the spinous process of 2D will usually point to the left. In primary lesions there is pain and local tenderness. That is pain in the acute lesion and tenderness in the chronic.

LUMBAR LESIONS

In many ways the effects of lesioning in the lumbar spine are more serious and more far reaching than other lesions. This is due to a wider relationship of the tissues and organs which are innervated from the lumbar cord and explains why the reflex effects of disease from any given sensory area are more profound, and more widely distributed, than is the case with lesioning elsewhere. Lumbar lesions are associated with oedema and congestion. The pressure of the oedematous tissues, the increased CO², and the accumulation of improperly oxidised katabolites in the tissue juices tend to reduce the efficiency of the nerve trunks and the sympathetic ganglia, especially those nerves which have very thin, or no medullary sheath. Lesioning at 1-2L lessens peristalsis in the small and large intestine and lessens dilatation of the intestinal blood vessels, and of the kidneys,

bladder, ovaries, testes and the pregnant uterus. Lesioning at 3-4L dilates the intestinal blood vessels, bladder and the reproductive organs and, often reduces peristalsis. In all cases there is gas accumulation in the intestines. The muscles of the colon are stimulated, and the anal sphincter inhibited, from 1L and 3-4S.

Normal defaecation is aroused by sensory impulses from the rectum and anus, while sensations from adjacent tissues inhibit defaecation, or, may arouse it if the normal stimuli are absent, in conditions such as haemorrhoids, vaginal irritations and irregularities. Micturition is accomplished in much the same manner. Lack of control of the visceral sphincters may accompany lumbar, sacral or innominate lesions.

FLEXION LESIONS

A flexion lesion is one in which a vertebra is fixed in the position of flexion, the joint being mechanically inert with pathological changes in the supporting and surrounding tissues. The spinous process is separated from the one below and approximated to the one above; the articular facets are slightly anterior at the anterior inferior margin; the disc is compressed anteriorly and stretched posteriorly; the posterior ligaments are thinned and atrophied, while anterior ligaments are thickened and relaxed. Similarly the extensor muscles are stretched and atrophied, and the flexor muscles are contracted. The spinous process may be posterior without a lesion being present, the proof of which is the loss of function and restricted motion. To test for movement place the fingers over the suspected lesion and strongly flex and extend the head with the patient in the sitting position. Flexion lesions differ from extension lesions in that we find the restricted motion in the interspace where there is separation of the spinous processes, and free motion where they are approximated. If there is movement above and below the vertebra in the presence of a prominent or depressed spinous process then we may suspect bony anomaly. The C/D and D/L areas are the most vulnerable to this type of lesion, due to the restriction of the dorsal and the greater motion of the cervical and lumbar areas. Sometimes the lesions form gradually from muscular insufficiency or, the first cause may be infection, toxin or irritation in the joint, in which case the patient may seek relief by means of uneasy and abnormal flexion.

EXTENSION LESIONS

In this type of lesion the inferior facets have glided down upon the superior facets of the vertebra below. In many cases the spinous processes are in contact giving rise to inflammatory changes and immobilisation. The intervertebral foramina are narrowed with deposit of connective tissue. The extensor muscles are contractured and the opposing flexors are stretched and atrophied. The 5th lumbar is commonly in extension, and from 3-7D. Group lesions are primarily due to weakness and then to faulty posture. There are secondary lesions of this kind from the effects of trauma, strain or ankylosis. If there is considerable extension the base is posterior at the sacrum and the spine is perpendicular. In trauma the body weight tends to carry the vertebrae into flexion so that extension lesions are not usually primary and are more usually compensatory above a flexion lesion below. This type of lesion results from trauma and concussion in some cases, but more frequently from strain, muscular inflammation from infection, contraction from irritation and anterior weight bearing in obesity, pregnancy and abdominal tumours.

ROTATION LESIONS

Rotation is found to take place in conjunction with side-bending. The rotation is described according to the side to which the body of the offending vertebra has rotated. The direction of side-bending in any joint depends upon the area of the spine in which the lesion occurs and whether there be also an element of either flexion or extension. If extension is present in small group cervical lesions then rotation and sidebending are to the same side, but if on the other hand flexion is present then side-bending is followed by reverse rotation. The dorsal area follows the cervical except in certain cases involving the cervico-dorsal junction; here a lesion of 2D in flexion may have rotation and side-bending to the same side. In the lumbar spine, extension being the free movement, one finds side-bending and reverse rotation, whereas flexion tends to approximate the facets and the movement is that of rotation and sidebending to the same side.

To give an example. In the case of a flexion sidebending to the left with rotation to the right of 4D one would find the spinous process deflected to the left and separated from that of 5D while the left transverse process of 4D is antero-inferior and the right transverse process postero-superior in relation to 5D. There is stretching of the ligaments at the site of separation

and strain and thickening at the point of approximation of the transverse processes. In the case of long rotation or side-bending curves then the situation changes to some extent. If the curve is functional the rotation is usually, but not always to the concavity, whereas in the case of an organic curve then rotation is to the convexity.

POSTERIOR LOWER LUMBAR LESIONS, PRINCIPALLY 4 AND 5L

These lesions cause muscular contracture or fibrous ankylosis. If there is lesioning of either 4 or 5L then there is usually a compensatory lesion of either the joint above or below. It is significant that all lesions of the hip joint start with some lesioning of either 4-5L or the L/S joint. When lesioning is extreme then the spinous process of 4 L is posterior to that of 5L or stands out on its own. (spondylolisthesis). Where compensatory lesions are found they are usually in extension, causing some narrowing of the foramina of 3-4L and the L/S joint. The resultant effects can therefore be expected to be concentrated at these joints. It can thus be postulated that lesions of the hips can cause irritability of the bladder. The principle somatic effect is restricted or lost movement, and lesioning of the erector spinae. The erector spinae are the extensors of the L/S joint; the antagonists to this group are the abdominal muscles and psoas major, which act on the whole lumbar spine and lumbo-sacral joint.

Contractures that are found in the abdominal musculature, must be relaxed, as well as those found in the spinal muscles before any attempt is made to move 4 or 5L.

INNOMINATE LESIONS

In the posterior lesion the innominate has moved backwards on the sacrum (Littlejohn considers that in this case normal articulation is lost and a transverse axis is produced at the level of the 2nd sacral spinous process. Thus in this lesion the innominate first moves forward in rotation on this axis and then posteriorly on the sacrum). The backward rotation is limited by the sacro-tuberous and sacro-spinous ligaments and the reaction of the sacro-iliac ligaments. Hence the anterior superior spine of the innominate moves superiorly and posteriorly, the tuberosity of the ischium anteriorly and forward, the posterior superior spine moves posteriorly, inferiorly and medially, the posterior part of the crest is prominent on the lesioned side, the acetabulum moves superiorly and anteriorly, thus producing a

shortening of the leg and external rotation at the hip joint, with inversion of the foot, which becomes greater as the condition progresses. The sacrotuberous ligament becomes tense due to the forward movement below the pivotal point and the ischial tuberosity becomes tender. The os pubis moves anteriorly and superiorly and the bone is tender on the lesioned side. The movement of the sacro-iliac joint is obviously impaired, and the innervation and circulation to the pelvis and lower extremity is also disturbed. Nervous irritability of the lower lateral abdominal quadrant may be found. The lesion of the innominate causes some weakening of the vertebral joints on the same side and tilting of the dorsal and lumbar areas is common.

One should note that when the lesion is on the left, the left pubis is raised, and palpation over the left ischial tuberosity will send a pain impulse up to the sacro-iliac articulation, and if this pressure is continued a similar pain will be experienced over the left pubic bone. Upward movement of the acetabulum will shorten the leg by as much as half to one inch; this will also cause tenderness of the soft tissues immediately inferior to the inferior iliac spine, giving a pseudo-sciatic neuritis, tenderness over the left ovary and irritation of the lumbar plexus. If the innominate has tried to produce 'self correction,' there may be an apparent lengthening of the same leg, that is to say a longer leg when supine and a shorter leg when standing, with fixation of the sacroiliac joint.

To test for mobility place the patient prone, and by using the arms to lift the head into extension, and thus the spine, place one index finger alternately on either side of the base of the sacrum, medial to the articulation, with the thumb in a median line at the end of the sacrum. While the patient is being extended, the sacrum can be felt to move between the innominates, but if the left side feels immobile and the right side hyper-mobile, this indicating a left posterior innominate. If the lesion is a recent one then some pain might be felt but if it is chronic then little pain will be noticed.

THE DIFFERENTIAL DIAGNOSIS OF EITHER A POSTERIOR LEFT OR ANTERIOR RIGHT INNOMINATE

It can be stated that the immovable articulation is the lesioned articulation. If one postulates that the right innominate appears to be in an anterior position, and the left in a posterior position then, apart from the obvious bony points, one would expect to find both tenderness and fixation

in a recent lesion. If the tenderness is found to be bilateral then a bilateral lesion is to be expected. The other changes for the posterior lesion would be the usual bony points, the less well known being an elevated pubic bone with associated tenderness, tension of the sacro-tuberous ligament and a relatively increased distance of the ischium from the sacrum on the lesioned side.

SOME OBSERVATIONS ON THE OSTEOPATHIC LESION CONCEPT

HERBERT MILNE

The art of medicine rests upon the knowledge of normal and morbid physiology. If we would know the abnormal, we must have knowledge of the normal first, so that we may be able to measure and appraise the pathological developments which we encounter. For medicine to become scientific, the knowledge of natural processes involved in health and disease must be more accurately and intimately revealed and understood. To grasp the nature of vital reactions of the organism to the normal and abnormal stimuli that, in turn, maintain or disturb the balance of function, and to visualize the complexus of events, from stimulus to effective tissue change, is to clear the path for the application of rational therapeutic means based upon the principles of applied physiology. The art of osteopathy must be no less than this, to correlate and apply existing knowledge of anatomical form and relationships, to the flow of physiological sequences that emerge from the contact of the living, functioning cells that together form the pattern of our bodies with an ever-changing environment.

What contribution of a special character has osteopathy made to the science of pathology? Is it in directing attention to the relation of faulty mechanics to health, or in the relation of structural malalignments to visceral disease? Important as may be these contributions, they are not the essential contribution upon which the science and art of osteopathy may be securely founded and rationally developed. The unique character of the concept of the osteopathic lesion to pathology, is that it comes well in the category of a primary aetiological factor, universally present whenever stimuli environment are of sufficient intensity or duration so as to induce stress and strain upon the organism in its efforts toward adaptation. This goes far beyond the concept of the bony lesion classified as a sprain, local in nature and having no wider significance in the general economy of the body. The changes in tissue tone in spinal muscles which we note as a prominent feature of the spinal lesion are indices of distortion of local and remote nervous influences, of disordered metabolism of cells, and chemical and physical changes of their surround; and consequently, of pre-diseased and diseased states.

In a state of health we find a condition of functional unity existing, in which organs and tissues maintain a condition of dynamic equilibrium, under the integrating influence of the neuro-endocrine system, and disease is seen to be nothing less than a dissociation of functional unity, while pathological processes become a struggle of the organism to secure balance in relation to the environment. The vital reactions in organs and tissues, constitute the adaptive responses to the environing stimuli which impinge upon the sensory mechanisms, and the character of which will determine the functional balance of the organism. Such stimuli may be of a physical, chemical or psychological order and the prime factor tending to induce pathology, is the contact of the organism with abnormal stimuli which introduce factors of stress and strain, and so upset the equilibrium. Abnormal stimuli then, of any character to which the organism has the power of response, may adversely influence structural and functional capacities and so bring about a state of disease. Research has concerned itself chiefly with the manifestations of the efferent elements of the nervous system, and it appears timely that more consideration should be given to the disturbance of the afferent impulses which participate in initiating vital reactions, that do not reach the sensorium.

W. Keiller (*Nerve Tracts of the Brain and Cord*) has this to say about afferent mechanisms:

“..... it is helpful to keep in mind the basic principle that no efferent mechanism in the nervous system is capable of action except under the influence of afferent impulses. If all the posterior afferent or sensory nerve roots coming from a limb be cut, the limb is just as much paralysed for all effective purposes as if the anterior, efferent or motor, nerve roots were cut. No centre for efferent impulses can act if it be cut off from afferent impulses. It follows that all centres capable of giving off efferent stimuli for purposes of motion or secretion, have underlying and necessary afferent tracts. Injury to these afferent tracts will seriously impair the action of efferent centres, and separation from all afferent paths, will render the generation and transmission of efferent impulses impossible.

“The anatomical basis of this physiological principle, is that all efferent neurons, or collections of neurons, are connected directly or indirectly with the periphery by means of one or several sensory neurons from skin, mucous membrane, or motor apparatus – as muscles, tendons, joints or bones. This fact must be kept constantly in mind if one is to remember the afferent and efferent paths of the nervous system.”

It will be then, with the anatomical basis of this physiological principle kept in the forefront of the mind, that we shall proceed to consider the evidence to be presented in support of the thesis of the ubiquity of the peripheral irritant as a primary factor in pathology, and as the starting point of that pathological entity which we have designated the osteopathic spinal lesion.

We shall argue the case that in such a highly integrated organism as man the idea that independent cellular reaction can take place and be maintained as a response to irritation, with the corollary that disease begins in the cell, is untenable. That the irritant acting on the receptors, produces a local change in the state of the nervous system which is, above all, a local change of the environment of the cells, and therefore a destruction of the normal physico-chemical state of the particular area. That the local changes in the nervous system are transferred to the centre, with modifications of the pattern of the reflex arc, and propagated by sympathetic paths to the tissues and viscera in central nervous relation, with corresponding physico-chemical changes constituting a neuro-dystrophy; that the vasomotor effects, important as they may be, are no more than secondary in importance to the primary trophic changes.

Biological stimulation is stimulation of living protoplasm, in which electrical and chemical changes are produced in the cell, with absorption and release of energy. The capacity for irritability is a fundamental requirement for any response to the energies of the environment. But it must be clear that the capacity to absorb and react to stimuli, is contingent on structural form. Within definite limits, this structural order is susceptible of modification of pattern by new molecular arrangement, under which function at a different level may continue, but the boundaries within which an initial structural disorder may be restored to a new level of physiological function are not very wide, and are determined largely by the inheritance of the individual which is the main basis of his present status.

From this it is seen that while stimuli are essential to the continuance of living adaptative processes, excessive stimulation may disorder the normal architecture of the cell and develop stresses in which the molecular movements of organic order are changed to that of disorder, loss of movement and death. For a molecule is not a static particle, any more than cell structure is static, apart from the rest of concrete life, but is an organised whole of processes, throbbing with the thrust of energy and, therefore, of motion. In the thrust and parry of the struggle of a species of

organism to secure its continued nutrition and existence, survival has depended upon the development of a suitable mechanism to assure nutrition and effective readjustments to the assaults of the environment. In the single-celled simple organisms such as the amoeba, the stimulus to adaptive behaviour is found in changes in the ionic equilibrium of that part of the media in which it lives, and electrical and chemical changes are produced as between the positively charged nucleus and the cytoplasm, with consequent molecular rearrangement and appropriate energy exchanges.

In the multicellular organisms of a simple undifferentiated type, filaments branch out from the cell nuclei and so it becomes possible to transmit from the cell stimulated impulses to other member cells. Cell differentiation leads to a more specific type of chemical response through the elaboration of cells capable of special secretions, so that the colony of cells under the influence of special chemical stimuli within, may bring about the necessary adaptive changes required for defence and nutrition. In this development we find the beginnings of an endocrine system. Coincident with this the filaments connecting cell to cell gradually change their structure and eventually become the basis for the nervous system which, when fully developed into what we observe in the more complex animal bodies as the central and associated autonomic nervous systems, largely dominate chemical methods of control and facilitate a more rapid mobilization of the organism's resources both for metabolic ends and to meet the urgencies of defence within the body itself, and the external environment. The neural and endocrine systems have thus become mutually related and reciprocal in function, the endocrine factors being responsive to stimuli coming over in afferent paths of the nervous system from the periphery to the cerebral cortex and the hypothalamus. From the centres in the cortex and the basal ganglia, the, pituitary is stimulated or inhibited and the trophic hormones of its anterior division bring into action or restrain other dependent ductless glands. It thus becomes possible for the nervous system to integrate the whole functioning of the endocrine system to meet the complex needs of the human body in a very effective manner, modifying the chemical state of the blood and tissues and tending to balance the physiological needs of the body.

This supremacy of the nervous system in body unity is a matter of first-class importance in any attempt to understand the rationale of disease and to formulate a basis for a scientific therapy, and it is in the search for those irritants that constitute abnormal stimuli, that the foundations of a sound therapy and practice may be found. If we accept the assumption that the

nervous system has a really direct influence on the biochemical reactions in cells and tissues thus exercising control of trophic processes, this study of the action of irritants which induce a state of abnormal stimulation, offers a very promising field of research. We have abundant evidence that the osteopathic lesion biochemically involves not only the local or proximal tissues, but also the innervated organ or tissue.

Pfeffer carried out an interesting and most important experiment on prepared cells of a species of moss with results of great importance to physiology. This showed that cell repair, in the form of producing a new portion of cell membrane round the anucleate fragment of a cell, occurred when the damaged cell was the neighbour of an intact cell and in contact with it by means of protoplasmic filaments. Hertwig comments: "Nothing hinders us then from assuming that some similar transmission goes on in other functional conditions." Cajal says: "But it is very probable that this nervous current or discharge which is conducted from the nucleated cell along the protoplasmic filaments to the anucleated fragment of the contiguous cell, also passes across into the fragment when it contains a nucleus and so, also, when it is replaced by an entire cell.

"This leads us to the conception that wherever intercellular protoplasmic connections are present, the various nuclear currents of discharges, stream through those connections and so permit a general nervous flux throughout the whole network of these protoplasmic bridges, in the meshes of which the nuclei themselves would constitute the nodal points. In this way one would have a continuous circulation or distribution of nervous electric energy through the entire organism."

The augmentation of the nervous system in these ways will have as its results, an augmentation of the trophic stimulus which it exercises; so that the cells situated along these ways will grow and proliferate more rapidly, thus producing a zone characterised by numerous mitoses. The augmentation of the vital processes of these cells, will, in consequence of increased osmotic attraction, attract a larger quantity of nutritive fluid, exactly as the wick of a lamp which is stimulated by a current of air, draws up by capillarity a larger quantity of combustible fluid. Cajal leaves us in no doubt here that he is fully confident of the trophic aspect of nervous function.

Crile and his associates have made notable contributions to a better understanding of the relationship of the nervous system to physiology and pathology. Crile demonstrated by prolonged research that: "The more

richly a given area is supplied with sensory and vasomotor nerves, the more rapidly is the animal exhausted, when such an area is subjected to injury. Infection, haemorrhage, asphyxia, cold, injury, exertion, stimulation, lack of sleep, emotional states, each added to the others. The constant factor, however, was always a loss of energy." He showed that surgical shock was not mainly due to impairment or breakdown of the vasomotor mechanism.

Normally, strong stimulation of the laryngeal mucous membrane produces reflex inhibition of the heart through vagal influence, as the recurrent laryngeal nerve is a branch of the vagus, but when a local application of cocaine is made to the mucous membrane before applying a physical irritant to it, reflex inhibition is completely prevented. This is obviously due to blocking afferent impulses. He also demonstrated that if local anaesthesia was applied to nerve trunks or the spinal cord, blocking afferent impulses from the periphery, no amount of trauma to the area peripheral to the block, could cause surgical shock. This showed that the mechanism that maintained the normal energy of the body in health was reached over the nervous system exclusively. Administration of an inhalation anaesthetic caused the hydrogenion concentration of the blood to increase steadily and, in consequence, to draw too heavily on the reserve of buffers, so that at the point when death occurred, all buffers had been used up and the blood became acid. In this condition of acidity (or alkalinity) the electro-chemical phenomena in the body cells and the nervous system cannot take place, and control and integration of function is lost.

The experiment of Pfeffer and those of Crile and his associates, offer substantial support to the central thesis of this paper of the trophic aspects of nervous activity as a general rather than a special function, and of the primacy of abnormal afferent impulses in the evolution of disease, in that Crile could abolish surgical shock by blocking afferent impulses from the periphery.

Pottenger says: "Every important internal viscus is so connected in the central nervous system, that it is able to produce reflexes through afferent sympathetic and efferent spinal nerves, with definite skeletal structures; and, if acutely inflamed, should show motor reflexes and altered sensation (pain); and, if chronically inflamed, trophic changes. Therefore, spasm of muscles, altered cutaneous sensation and degeneration of muscles, subcutaneous tissues and skin, in an area having definite limited segmental innervation, become important diagnostic phenomena."

Body co-ordination being effected through the action of the nervous system, permits normal afferent visceral impulses to effect reflex modifications of somatic and visceral function, while impulses arising in somatic tissues are, in turn, capable of reflexly conditioning visceral function, thus producing an ordering of those normal physiological events, necessary to meet the demands of a changing environment in which the vital adaptations are in equilibrium with the outer world of events. These are the fundamental reactions of all complex animal bodies, and a consideration of these factors of the nervous co-ordination of the internal and external needs of the body, would clearly suggest the existence of both a viscerosomatic and a somatico-visceral reflex. The experiments of Burns to demonstrate the spinal centres have produced much objective evidence along these lines.

Some very interesting data bearing on this question was brought forward in the *British Medical Journal* of February 12th, 1939. "Schweitzer has shown something of the extent and importance of the changes that afferent visceral impulses can bring about in producing reflex modification of visceral and somatic activity. Thus, stimulation of the central end of the vagus, distention of the urinary bladder, a gentle handling of the small intestine may diminish somatic muscle tone and also abolish knee-jerk. Similarly, increasing the pressure in the carotid sinuses, not only reflexly affects circulation and respiration, but may also modify skeletal muscle tone and induce a condition indistinguishable from normal sleep. In exceptional circumstances, stimulation may give rise to pain, which may be vaguely localised or referred to distant parts. In the case of the gut, the appropriate stimulus is usually a change of tension in the muscular coat. In the case of the heart, it results from the action of chemical, substances liberated during ischaemia." The study of the reflex arc mechanisms which make possible the adaptive changes to the call of the environment, and which regulate the internal state of the body so as to maintain a relatively stable inner environment, lie at the very core of the problem associated with the osteopathic lesion.

Further study of the nervous reflex arcs is necessary and, in particular of those afferent impulses arising from visceral disease which are finally registered in somatic tissues by changes in muscle tone and tension, and the exhibition of pain. Equally true, it is necessary to study the afferent paths and impulses arising in somatic tissue, which culminate in visceral disorder and biochemical change. "The function of a sensory nerve's peripheral end is to gather any stimulus that may act upon its end-organ, and transmit it to

the spinal cord and brain, over the pathways provided by the nerve fibre. A given stimulus will cause a much greater stream of impulses to be sent along the fibre if applied to end-organs, than if applied to the nerve fibre."

Thus it will be seen that a peripheral irritant acting on the sensory nerve filaments may produce reactions of a more profound character than injury to a nerve fibre, and this conclusion is subscribed to by Livingstone who says, "I believe that the principal factor in determining the degree of disability a particular lesion may entail, is not to be measured solely by the evidence of injury, but by the manner in which such a lesion happens to irritate sensory nerve filaments." He elaborates upon this when he states that: "A partial lesion of a sensory nerve forms a focus of irritation that produces a sustained barrage of impulses from this focus, acting on the internuncial pool of neurons in the cord it serves to disturb its normal functioning; the shunting of incoming impulses is altered, so that the pattern of excitation is changed. The continued activity within the pool plays upon the motor cells of both the anterior and lateral horns of grey matter; the muscle spasm and vasomotor abnormalities which result lead to peripheral changes that furnish new sources of pain impulses; and, finally, as the intensity of this self-sustaining process increases, other systems of integrated neurons are drawn into the process."

Starr adds a valuable contribution to this when, in discussing trophic changes, he writes: "Such trophic symptoms develop only when the nerve injured is a sensory nerve. The true explanation of trophic changes is to be found not in the hypothesis of an injury to trophic nerves, but in the fact that ordinary sensory impressions are interrupted or perverted, and nature, lacking in her accustomed guide to repair, is misled by abnormal impressions." Trophic function is contingent on the complete integrity of the reflex mechanism, based upon the physiological stimuli to afferent nerve filaments and perfectly adjusted to the efferent impulses which mobilize the reparative power of the cell. Bose says that: "The normal conductivity of a tissue, by which its proper functions are discharged, can only be maintained fully by a supply of energy, which must be received from the environment. When animal nerves are isolated they lose their power of conductivity and excitability, their response becoming abnormal, or are entirely abolished. And it is only by accession of fresh energy of stimulus that the normal conductivity and excitability are restored. It is further known, that where the nerve loses its excitability, undergoing consequent degeneration, the attached muscle exhibits disintegration. It will thus be seen that the various tissues of the organism are maintained in their normal

functional activities by means of energy conveyed to them through the nerves.”

From these contributions it will be seen how important is the relation of the quality of afferent impulses coming in from the periphery over the sensory nerve filaments, to the functional and trophic aspects of cellular activity, and that abnormal stimuli may impair the nutritive and reparative capacity of the cell. In discussing the results of animal experiments in which temporary and permanent lesions were produced in the interscapular region, Burns says: “During the period of the abnormal contraction of the interscapular muscles, however produced, the reflex effect upon the pulmonary vessels was such as was produced by the steady pressure of the experimenting fingers. The vessels were dilated in the same manner as was seen in the vessels of the animals subjected to the same experiment. Any manipulation of these muscles resulted in their relaxation, and in the return of the cycle of sensory, vasomotor and association neurons, and their vascular musculature to a normal condition. It seems that contracted muscles, or bony lesions, in the area of the lung centre, or its immediate neighbourhood, exert an inhibiting influence on the vasomotors of the lungs, leading to their dilatation, and to low systemic arterial pressure. The relaxation of these muscles, however secured, removes the source of the abnormal sensory impulses. Then the circulation becomes normal as soon as the vascular walls and the neurons affecting them, recover from the effects of the abnormal influence.”

In this example discussed by Burns we have objective evidence of the effects of spinal lesions experimentally produced, in which a physical peripheral irritant has been induced, by increasing intra-joint and reflex muscular tension, with abnormal stimulation of sensory nerve filaments in spinal muscles and ligaments. This transformation of the physiological pattern of ingoing impulses into a pathological combination, is operative on efferent neurons with inhibition of the normal functional regulation of cellular metabolism and vasomotor activity. In the organism sensitized by abnormal stimulation, further stimulation may produce inhibition, rather than an increase in functional response. This is what apparently took place in the experiment referred to, as the normal maintenance of vasomotor tone through sympathetic activity passed on to a loss of vessel tone and dilatation. The state of a tissue, that is to say, the balance of its vital elements, its physico-chemical relations, and the energy exchanges with its surround, is mainly dependent on the plastic regulative quality of a nervous character in relation to it. Changes in the mobile quality of nervous

impulses diminished molecular mobility in cells and tissues, effecting modifications in biochemical reactions. In the presence of the spinal lesion the mobile quality of the reflex arc mechanism is impaired. The essential feature of the osteopathic spinal lesion is the existence of a peripheral irritant, which constitutes the basis upon which the lesion is developed. The intra-joint tension, positional maladjustment and muscular fixation, with diminished mobility, are a response to abnormal stimulation over afferent paths. This is equally true whether the lesion be primary, and due to injury, or secondary, and due to reflex action. In the case of the primary lesion, the incidence of trauma on the spinal ligaments, passes from stress to strain, with disturbance of the molecular pattern in the fibres of the ligament and a developing irritation operative on the sensory nerve filaments, which is reflexly transferred to the spinal muscles, inducing a state of joint tension and muscle fixation, and to the spinal cord and viscera in segmental relation.

Prolonged study and observation have shown that the preponderance of spinal lesions is reflex in character. The changes in the sympathetic ganglia, spinal cord, spinal muscles and ligaments occur in response to the activity produced by a peripheral irritant operating in a viscus, internal tissue, or somatic structure. Here, the reflexly contracted muscles increase joint tension, produce ligamentous strain and set up another focus of peripheral irritation in addition to the primary focus in the viscus. That the remote effects of the spinal lesion are proportionate to the degree of maladjustment has been demonstrated to be untenable, for observation has made it abundantly clear that a minor degree of bony distortion may be associated with marked changes in visceral function. Further, it has been repeatedly demonstrated that soft tissue treatment, which had little objective effect on the bony lesion, has often brought about striking physiological reaction in related tissues. These phenomena are not to be explained on the assumption of release of pressure on the nerve trunk in the intervertebral foramen, although pressure here may occasionally occur in the soft tissues as a secondary effect when oedema is pronounced. The fact, however, that changes in viscera occur virtually at once on production of the lesion, show the visceral reaction to be reflex in character and arising from irritation to sensory nerve filaments in the ligaments, as these arise before the mechanical factor has come into operation. The spinal lesion is a restriction of mobility within the normal range of movement of the articulating facets and is not a subluxation. The subluxation arising from

the forcible movement of the articular facets beyond the normal range is not an essentially osteopathic condition.

The pathology found in the greater osteopathic lesion presents itself as a composite picture, secondary to the existence of a peripheral irritant at some point within the peripheral field. In the one case arising from trauma, and in the other from visceral sensory irritation acting on the reflex arc mechanism. The fundamental feature here is the evolution of intra-joint tension with an accompanying increase in inter-cellular pressure of the peri-spinal tissues. This excess of abnormal tension conditions molecular mobility in the affected tissues and imposes an unusual form of stimulation upon the sensory nerve filaments in ligament and muscle, causing a suspension or inhibition of the tonic function of trophic and vasomotor activity. As Bose has demonstrated, nervous conduction is increased or decreased by the induction of a change in molecular relations, which either increases or decreases molecular mobility, and a characteristic of the palpable spinal lesion is a fixation of muscle tone which, of necessity, is an aspect of diminished molecular mobility. Certain forms of mild peripheral irritation will engage the mechanism of the axon reflex, which will bring into action locally adaptive responses. Above this level the irritant may reflexly produce a type of osteopathic lesion which only the most delicate and discriminating palpation may discover. This type of lesion would appear to be the outcome of a condition of peripheral irritation of low intensity within a viscus or somatic tissue, which does not carry the reflexly induced changes in the spinal soft tissues to the point where the typical objective lesion is evident. When arising in a viscus, it may be taken as an indication of vegetative imbalance in which molecular stresses are reflexly produced in spinal muscles, with corresponding changes in the associated nervous elements. The process here has proceeded to the degree of molecular stress only, but may, if it becomes intensified, develop from stress to strain, until the customary gross changes found in the typical lesion, become evident. Grossly palpable changes in muscle tone will not be found, but some degree of abnormal intercellular tension is present and, once established, is capable of adding to reflex disorder.

From this incipient form of spinal lesion through the considerable range of reflexly induced spinal pathology, to the most severe form of primary traumatic lesion, is only a matter of degree, varying in form, but involving the same fundamental processes, and having an identical starting point in the injurious effects of an irritant, which changes the normal physico chemical state in a tissue region, with resultant alteration of the nervous

elements serving it. The mechanism of the nervous system which effects body co-ordination by adjusting its internal and external needs one to the other, produces a unity of purposive behaviour, and is here found to be labouring under the impact of an abnormal factor in the environment, which induces a change in the nature of the nervous impulse to one of pathological quality. This then creates a pathological focus at the centre, forming a nidus through which disordered messages are relayed between visceral and somatic tissues in a self-perpetuating vicious circle. These nervous connecting links between visceral and somatic tissues are well authenticated. Boeche demonstrated the presence of sympathetic nervous elements connected with muscle fibres and not with blood vessels. Orbele concluded from his experiments that the sympathetic nervous system exercises a direct influence on the tonus of striated muscle, and sympathetic fibres have been traced to the interior of the Pacinian corpuscles. Each spinal nerve from D1 to L2, contains fibres belonging to the two systems—the somatic and the autonomic—as well as fibres connecting the two systems with one another. And it is by these avenues, or co-ordinating pathways, that the reflex modifications outlined in the editorial of the British Medical Journal referred to, are made effective. This is also the venue of the osteopathic lesion.

What then is the essential nature of the osteopathic spinal lesion? It is a reflexly induced pathology which may proceed from the incipient lesion, with its abnormal increase in intercellular pressure in spinal ligament and muscle, to the most objectively developed bony lesion, exhibiting gross fixation in muscle tone and distortion of bony relationship; but the common denominator in all these stages of development is diminished mobility. Associated with this state is a condition of tension in muscle and ligament, particularly in muscle, in the incipient lesion, and of intrajoint tension in addition, in the bony lesion.

Abnormal tension and diminished mobility alter the physico-chemical status of muscle and ligament, with the inception of an abnormal stimulus to the afferent nerve terminals that supply them, and thus set in train, those series of events which produce a pathological focus in the spinal cord and modify the electro-chemical reactions in sympathetic ganglia, with resultant changes in the bio-chemical state of the viscus in relation and a perversion of its physiology. The oedema, diapedesis and diminished alkalinity are the secondary factors. The important feature to note is the diminished plasticity of soft tissue, with a consequent loss of adaptive capacity to reflexly condition the organism in relation to its environment, and the diminished

plasticity of the normally mobile nervous elements, which render this mechanism less capable of fulfilling its pristine function of integration. Too much has been made of the diminished alkalinity as affecting nerve conduction, and little attention has been paid to the more important aspect of nerve conduction, which is the outcome of the change in molecular relations in the nerve itself, with a consequent diminished conductivity. We know that sensation, and therefore response, is modifiable, and that the conductive power of a nerve is not a constant, being capable of change; so that the resistance to the passage of an impulse can be either increased or decreased. Conduction depends on the mobility of the molecular particles. If mobility of the molecular particles is diminished, conduction of the impulse will be weakened in proportion to the degree of lost mobility. The development of the osteopathic lesion, conditions the mobility of the molecular particles, and treatment is a means toward the restoration of their normal mobility, in which state the physiological plastic responses of nervous tissue may again resume their normal regulation of cellular function.

The unique contribution of osteopathy to the science of pathology is not only in postulating a neuro-genic basis for disease processes, for others have also done this, but in focusing attention upon the reciprocal aspect that abnormal nervous reactions, induced by peripheral irritants, exercise upon the intimate functional relationship of the spinal tissues and their contained nervous elements, with those of viscera and other internal tissues.

Osteopathy has shown that in the spine and its supporting soft tissues, we have indicators of body disorder in remote regions which present us with a ready means of recognising early departures from normal function, as registered in the modifications of muscle tonus in an affected segment. It has also demonstrated the lesion as a cause of, and a maintaining factor, in visceral disease. To the art of healing, osteopathy has offered a basis for a theory of medicine, which extends beyond the boundaries of any other contribution in the field of medicine, in that it provides a key to rational therapy based upon the application of those measures capable of restoring the normal functioning of the reflex arc mechanism within the inherent resources of the individual. In addition to this, it has developed as its chief means in its therapeutic armamentarium, a technique of manipulation which goes to the strategic centre of the body where regulative direction is poised, and proceeds to remove the causative and maintaining influences which have disordered those harmonious exchanges upon which the

dynamic equilibrium of the body rests. These are no mean achievements made by osteopathy in its rather more than eighty years of existence, but we must not rest here. There are notable gaps to be filled and the profession must press on to gain further knowledge by research and practice in the art of observation.

THE PHYSIOLOGY OF THE TREATMENT OF THE STILL LESION

C. G. BECKWITH

The purpose, type and duration of osteopathic treatment varies with the condition being treated. A knowledge of what has occurred to upset the physiology of the part or the organism as a whole is essential before a treatment regimen can be intelligently formulated. It is not in the realm of this paper to discuss the diagnosis of osteopathic pathology, but rather to describe the changes that occur about a lesion site and to infer, perhaps, the best means whereby it should be possible to effect a change that will permit and facilitate the recovery from a distortion of the physiological balance.

The essential pathology at the site of a Still lesion is an inflammation involving the structures of a joint to a varying degree. Inasmuch as it is this inflammation that must necessarily determine what should be done, it merits further consideration.

Boyd (1) states that an inflammatory process has three phases: first, the vascular change which provides for the second, an inflammatory exudate and third, the process of repair.

The mechanism whereby there occurs a transudation of fluid through the capillary walls has given rise to several theories. Bellis (2) states: "Tissue swelling occurs through the agency of increased capillary permeability and intra-capillary pressure. The increasing tissue pressure causes venous compression and augmented venous pressure a further increase in intra-capillary pressure." Menkin (3) believes: "Fluid passage through the capillary walls appears to be the resultant of several factors. The inherent and independent contractility possessed by the capillary wall, reinforced by nervous control in the form of either vasomotor nerves or local axone reflexes, doubtless plays some role in altering the capillary blood volume and thereby indirectly affects fluid passage."

Findlay (4) stated that histamine-like substances liberated at the point of injury caused a local dilatation of the small vessels and arterioles and increased the permeability of the local vessel walls. Bayliss and Gaskell (4) showed that carbon dioxide is a capillary dilator, while Recker and Regendanz (4) maintained that the capillaries are not more permeable, and that the composition of the oedema fluid could be explained by the increased capillary pressure. Other observers insist that the capillaries are rendered highly permeable during inflammation; still other investigators

have explained the apparent increased permeability as due to capillary stasis and opening of intravenous anastomosis with the establishment of a greater capillary bed.

Moon (5) states: "The capillaries are influenced to some extent by vasomotor control, but their delicate adjustment to the functional needs of the tissues is apparently independent of innervation."

Pendergrass and Hodes (6) characterise inflammation as "slowing of circulation, oedema, leucocytosis and thrombosis of lymph vessels and capillaries. This thrombosis is thought to be a protective mechanism, preventing the dissemination of toxins."

Whether the inflammation occurs as the result of increased capillary permeability, thrombosis of lymph vessels and capillaries, stasis, increased capillary and arteriolar bed, intravenous anastomosis, nervous control, the elaboration of histamine-like substance or what Menkin calls 'leucotaxine', or other processes, the fact remains that capillaries or arteries may contract or dilate independently, (5a). Burton (4) showed that from full constriction to full dilation there was an increase of from 5 cc to 60 cc. per minute per 100 grams of tissue (in digital vessels of frog), and that in the early stages of inflammation, blood plasma" is poured out in such quantity that adequate absorption is impossible. It accordingly collects in the tissues bringing with it antibodies. It is especially abundant in loose connective tissue and in the serous sacs."

The progress of inflammatory process may be indicated by the healing of cleanly incised wounds as described by Boyd (1a).

At the end of:	These changes have occurred:
12 hours	vascular and connective tissue reaction begins
2 days	granulation tissue appears
4 days	temporary clot replaced by granulation tissue
5 days	epithelium covers, fibrils appear
3 weeks	dense non-vascular scar tissue is formed

The changes associated with a lesion are not often the result of a complete severance of tissue as occurs in a cleanly incised wound so that there is not the need for the establishment of new circulatory channels. The desirable end result is not one of dense, non-vascular scar formation but one in which there is a minimum of scar tissue. Trueta (7) has stated: "Most tissues of the human body have a highly recuperative power although this varies with the type of tissue. Skin ranks first and the muscles and central nervous system last." The ability of the muscles to resist stretch more successfully than ligaments probably accounts for the more severe changes in the less elastic ligaments in case of the osteopathic or Still lesion. The muscles are involved in part from the injury and in part in accord with Hilton's Law (8a) which states: "The same trunks of nerves whose branches supply the groups of muscles moving a joint, furnish also a distribution of nerves to the skin over the insertion of the same muscles, and the interior of the joint receives its nerves from the same source." While all tissues around a joint are involved, the most important site is usually in the ligaments.

The organisation of the inflammation process is from the stage of exudation to the pre-fibrous to the stage of fibrous tissue formation. At such time as the strength of the pre-fibrous tissue is sufficient to resist the stretch of use without an aggravation of the inflammatory process, activity of the patient will tend to minimize the formation of scar tissue.

Of particular interest as to the part of the inflammatory process associated with a lesion may play in disturbing the physiology of the body is the work described by Speransky in *A Basis for the Theory of Medicine*. The material is sufficiently relevant to warrant a rather lengthy summary. While the following excerpts are not quoted verbatim, nor yet in the order in which the conclusions from experimentation were reached, the material is derived from Chapters XVII and XVIII of the book.

"Changes affecting the nerve ending in the skin, cellular tissues, muscles, etc., can be quite as severe as direct injury of complex nerve structure such as a nerve trunk or nerve ganglion, thus nerve irritation may arise at the nerve endings at the very start. The first stages of the development of a process are connected to a considerable extent by the location of the process.

"The immediate irritation may provoke a dissimilar process of a biochemical nature in various other parts of the organism. If the irritation exceeds a certain strength, each nerve cell involved in the process becomes

itself a source of irritation and creates new foci for the latter. The nervous component of the inflammatory process is a positive or physiological factor unless the irritation is excessive in which case it passes into a dystrophic or pathological form.

“Neuro-dystrophic processes combining with the inflammation aggravate the latter to a marked degree bringing about a local change in the environment, and a destruction of the normal physio-chemical state of the region. Whether this change comes about as the result of an external agent or a variety of processes the character of the reaction will be the same as the damaged element of the organism becomes a foreign agent for it. Consequently the nervous system is itself capable of being the organizer of the inflammation and of creating the injurious influence which produces the inflammation.

“Influences exerted on it (the nervous system) can remain local (that is disappear without going beyond the simple reflex arc) only in cases of so-called physiological stimuli, and even then only if the intensity of the stimulus does not exceed a certain degree. Unusual forms of stimulation bring into action a number of nerve mechanisms. Inhibiting some functions we excite others; distort their normal course of development, and transfer the process into new nerve regions. One must add here that individual peculiarities left behind in the form of past stimuli, can alter both the direction and strength of stimuli newly encountered.

“For the tissues at the periphery to be in a state of continuous irritation, or in a state of ‘readiness’ to pass into an obviously pathological condition, it is by no means necessary that the irritating agent should be demonstrably external, or that it should be possible to find it among the injured elements, or to isolate it and extract it from them.

“The mechanism of local immunization is not confined to the action exerted directly on the underlying tissues by the immunizing agent. Chemotaxis as a cell reaction underlying immunity undoubtedly occurs; however, we observe that the extent of the reaction depends on certain influences from the centre, i.e., that the nervous system controls to a certain extent the functions of the mobile elements which play a role in immunity.

“Pathological tissue changes that had temporarily disappeared were renewed and usually at the places previously affected. Consequently, there must have been established in the organism some kind of permanent points which continue to retain traces of the past injury. Temporary recovery was no evidence of the final liquidation of the process. Since the cause, not

only of the original changes, but also of the relapse of the process and of the provocation of this relapse lay in agencies of a nervous nature, the changes themselves merely reflected at the periphery another process that developed within the nervous system.

“.....in the analysis of the general complex of conditions of acute inflammation, lasting hours or days, we are compelled to put the nervous system in the forefront; in chronic inflammation, its role is still more marked. Indeed, in chronic inflammation both the maintenance of the primary focus and the formation of the secondary foci becomes nothing less than a new pathological function of the nervous system.”

It is interesting that a fairly adequate summary of this work of Speransky might be quoted from Hulett's *Principles of Osteopathy* (10) published in 1906. “Changes in blood supply and drainage permit changes in osmotic conditions and hence changes in activity of cell selection and rejection; lessened cell nutrition regulation will result. Metabolism may be abnormal from a changed nature of nerve influence. Undoubtedly in the case of most cells of the body, their activity is partly under control and co-ordination of nerve influence. An excess of that influence will be cause for the accumulation of catabolic products constituting the occasion for fatigue. This means that the nerve initiates a too rapid transformation of potential energy of cell protoplasm into kinetic energy of chemical and vital activity. This additional activity will further initiate new changes immediate and remote and a chain of events will be inaugurated. A deficiency of nerve influence, on the other hand, will permit of a lowered resistance to other stimuli, with one or both of two effects, atrophic change in the tissues or a perverted quality of metabolism.”

If the results of Speransky's work are applied to the osteopathic lesion, our treatment has its effect in part at least through alteration of the tissues at the site of the lesion. It is through a change in what may be termed the irritable focus that has drawn the nervous system into what he terms a dystrophic process, that the benefits are derived. The result of altering the tissue at the site of lesion is a lessening of the degree to which the nervous system exerts a deleterious effect on the body as a whole. Thus if we can control the inflammation at the lesion site, we can minimize the ‘dystrophic process.’

The work of Denslow on the nervous changes associated with a lesion confirms the involvement of the nervous system in the Still lesion and indicates the benefits to be derived from the removal of the ‘irritable focus.’

That the nervous system plays a part in the pathology of inflammation is indicated by the results obtained by Gorell (11) in injecting what he calls 'trigger points.' He obtained favourable results in the majority of muscle, fascia and ligamentous pains by injecting the painful area, the area round it or between it and the spinal column, at a point that is specially tender, using a solution of 1% procaine. Argo (12) considers that the use of a local procaine injection into the ligaments in cases of low back strain is indicated on the basis that it breaks the reflex arc responsible for the pain. The pain is considered as arising from the irritation of sensory nerve endings in the injured ligaments which irritation is reflexly distributed to other post-axial nerve trunks.

The effect of this procedure is explained by the action of local anaesthetics. Cushny states that cocaine (whose action is similar to that of other local anaesthetics) "reaches not only the nerve terminations of the subcutaneous tissues but also the finer nerve bundles, and these too are rendered insensible as far as the solution extends to them." In proper concentration, the solution "has a selective action . . . sensory fibres fail to conduct sensory impressions while motor impulses pass without difficulty."

Thus the injection of the trigger points could conceivably minimize the neuro-dystrophic process that would be capable of perpetuating the inflammation for a period of time. This does not imply sanction of the procedure so much as it is meant to recall to your attention the similarity of this management to some conditions as treatments based on "Chapman's Reflexes."

The principle of this injection of the trigger points may be adapted by the use of ethyl chloride as a local anaesthetic. "On striking the warm skin it (ethyl chloride) vaporizes with such rapidity that it freezes the tissues. This produces local anaesthesia of a moment's duration." (13) Frequently a numbness or pain present in an extremity may be materially improved by its use in an area of extreme sensitivity. Inasmuch as the action is similar to, though less marked, than that of other local anaesthetics, its use might be considered as beneficial in those cases in which the longer lasting anaesthetic has been useful.

TYPES OF TREATMENT

There are several types of treatment that are effective in selected conditions for the alteration of the inflammatory change that is present in association with the lesion. These all have as their objective the alteration

of the inflammatory change that is present in some or all of the supportive tissues of the joint. The present discussion will include the soft tissue, articular, specific corrective and general treatments.

SOFT TISSUE TREATMENT

The main effect of soft tissue treatment occurs as the result of relaxation of structures, particularly the muscles. While in many instances this type of treatment might be considered a specialisation of massage, it should be applied carefully, intelligently and specifically. Its prime effect is of necessity through the medium of circulation, and in reference to lesion pathologies would be most useful in the acute stages. Palpation of the structures concurrently with treatment reveals the release of the tension, at which time further treatment is not indicated. Other indications for this treatment in cases in which it might be desired to secure better drainage from the head and neck, could be accomplished by the relaxation of the muscle and fascial compartments of the anterior neck. Again in cases in which contracture of muscles and ligaments readily accessible to the palpating fingers interferes with the physiology of the part, the use of direct forces on and to the soft tissues would be beneficial.

ARTICULATORY TREATMENT

Articulatory treatment usually carries a joint or joints through the permitted range of motion. In the presence of restricted motion associated with lesion changes, the joint is carried through its ranges of free motion and in those motions that are restricted, it is carried as far as possible without discomfort to the patient. A repetition of motion into the restricted ranges will frequently allow tense muscles and ligaments to relax somewhat, and in a sense, this type of treatment may be considered as affecting soft tissues. As in the case of soft tissue treatment, application of force as well as the release of force must be slow. While articulatory treatment is effective in the three gross groups of inflammation – acute, sub-acute and chronic – it probably has its greatest usefulness in the acute and sub-acute conditions.

SPECIFIC CORRECTIVE TREATMENT

In the application of force to a lesioned joint to ‘correct’ an abnormal change, it should be remembered that the force must be accurately

controlled, accurately localised and must be applied judiciously. The primary purpose of this technique is to stretch specific structures with the idea of removing the restriction of joint motion. The implication that freedom of joint motion is the criterion of a normal joint is true only in the sense that a joint capable of free motion must of necessity be free of an inflammatory change that would restrict its motion. The application of force, then, must be sufficient to affect a stretch of the inflamed tissues, in the desired direction and only to the desired degree. If not accurately localised it may affect normal structure. If not sufficient it will fall short of its objective. Many lesions require considerable preparation before the specific corrective force may be applied. This type of treatment is particularly useful in sub-acute and chronic conditions, less so perhaps, in the acute until the active inflammation has subsided.

GENERAL TREATMENT

A general treatment usually includes the use of those already described and administered in varying amounts. While this type of treatment is probably the one most commonly given by the average osteopathic physician, McConnell (14) has stated that a general treatment should be given only in three conditions: 1- constitutional conditions that should be treated symptomatically; 2- anaemic cases and 3- when one is ignorant of the real cause of the disease. He does not concede that a fourth indication might be one in which the patient feels he needs a 'thorough' treatment to get his money's worth. Eggleston (15) has observed that osteopathic manipulative treatment has a powerful effect on the dynamics of the body function; effecting an immediate change in the physiological findings, (pulse, temperature, respiration and blood pressure) in 90% of patients. This effect is frequently pleasing to the patient. However, it is not always the indicated treatment. It has a definite usefulness, but it also has its limitations. The advisability of a relaxation of the spinal structures from the occipital condyles to the coccyx, articulation of all the spinal joints, plus the correction of all existing lesions is, in most instances, far too powerful a formula. It is possible to overtreat a patient, even when using soft tissue as the medium of procuring a change.

POSOLOGY

In compounding our prescription for osteopathic treatment we have then four common ingredients: soft tissue work, articulation, specific correction and a combination of all of them, the general treatment.

These are indicated in various proportions depending on the stage of the inflammatory process present in the tissue involved in lesion. While the terms acute, sub-acute and chronic as applied to an inflammatory process are not strictly accurate inasmuch as there is considerable overlapping, their use in the sense that acute implies hours, sub-acute days and chronic days, weeks or months may be employed.

ACUTE CONDITIONS

For the purpose of this discussion, the acute conditions may be sub-divided into two groups. The first group would include traumatic lesions – sprains. The joint has been subjected to a variously severe injury and aside from the interference that the inflammatory process exerts on joint mechanics there is no repetition of the insult to physiology. This first group then might be termed primary acute lesion. The second group would include those changes round spinal joints that occur as the result of a process remote from them. Included in this group would be the acute infectious diseases, where certain pathogenic organisms tend to perpetuate the process, with marked distention of a gall bladder, the presence of a stone trying to pass through a duct or other conditions in which there is occasion for the continuation of the irritant factor. These may be termed secondary acute lesions. In these, the changes in the spinal tissues have developed probably from filtering action of the lymphatics or other structures attempting to neutralise toxins thereby setting up abnormal impulses in the muscles, or from the spill-over of abnormal impulses from a visceral disturbance. Thus the change in the spinal tissues tends to aggravate the condition responsible for its existence. Relaxation of these structures not only permits of a return to normal, but also helps to remove the irritation tending to perpetuate the original disturbance. This effect in acute infections, as in the case of influenza, not only favourably affects the progress of the infection but also affords gratifying if only temporary relief to the patient. In the case of a stone in the ureter, relaxation of the spinal muscles showing undue tension in the region of innervation frequently relieves the spasm sufficiently to permit the passage of the stone. The effect

of relaxing these spinal structures is exerted not only directly on them but also through them on the original irritant.

PRIMARY ACUTE CONDITIONS

The essential pathology in this group of conditions is the stasis that has occurred.

This takes 24 to 36 hours to reach its full development. If seen within 24 hours of the time of injury, the average case is probably best managed by the use of soft tissue treatment to procure relaxation of structures, gentle articulation as is permitted, and, if the tissues are ready for it, correction of the lesion by the application of specific force or forces. The time necessary to affect the desired changes in the tissues varies with each case from a few minutes up to half an hour. Many factors enter this - the severity of the reaction, the age and physical condition of the patient, associated conditions, focal infection and many others.

Page (16), quoted by McCole, has stated "muscles are of the first importance in the acute lesion and with ligaments are of importance in the chronic lesion." Hulett (17) has stated "an acute case will need treatment one or more times per day during the more critical period." This is in accord with Barber (18), McConnell (14), Tucker (19), and McCole (16a). McCole has summarised the management of the acute stage by stating: "When tissues begin to respond, one treatment a day is sufficient. When adjustment is partially gained, or when tissues have lost their tension every other day is enough."

In view of the fact that it may be considered that the inflammatory change occurring in the tissues sets up abnormal impulses that tend to perpetuate the process, our attention must be directed to this inflammation. In the acute stage, this tissue reaction is more apt to be the result of the failure of venous drainage rather than of an adequate arterial supply. Measures to aid the venous phase of the circulation are thus the most apt to produce a favourable response of the tissues to any form of treatment and this is the indication to stop. While this response is difficult of description, it may be compared to the change that occurs when a piece of cloth that has been starched becomes 'wilted.' While the tissues will still be irritable in the acute stage, the feeling of relaxation is definitely appreciable. While the change that occurs in the tissues of a sub-acute or chronic lesion as the result of treatment is somewhat similar, it is not nearly so marked. The 'softening' of the tissues is an indication to stop.

Continued treatment will serve no beneficial purpose and may even add further irritation. The rest that is needed for the tissues can usually be afforded by the application of adhesive tape. While occasionally a case will not need taping, most patients seem to appreciate the restraint that this form of support affords. The purpose of strapping the injured part should be to limit motion rather than to prevent it. The strips of adhesive should run up from the pelvis rather than encircling the pelvis.

The amount of activity permitted the patient varies with the pain produced by motion. If there is little or no pain following treatment and taping, guarded use of the part may be permitted. In these cases the effect of the careful use of the muscles may materially aid in the reduction of the existing inflammation. If, however, there is still appreciable pain after these measures have been used, it is sometimes necessary to insist on bed rest for a period of 24 to 48 hours. The bed should preferably be firm and unyielding. The use of intermittent heat—20 minutes on, 20 minutes off and then 20 minutes on—will afford marked relief in most cases. It is probable that the continued use of heat over long periods of time or applied too often may actually increase the swelling and congestion. Heat should be applied before retiring even in those cases that are relatively symptom free, in view of the fact that the use of the part during the day undoubtedly produces some stasis and a ‘freshening’ of the circulation will be beneficial.

The case of an acute muscle or ligamentous strain, uncomplicated by factors mentioned earlier, physical conditions, postural or developmental deformity, should be seen for the second time in about 24 hours when there should be a marked improvement. On this second visit the tape can usually be removed and left off. While some soft tissue work is indicated, usually more attention can be given to articulation and correction. Seen for the third time in another two days, the patient should be practically recovered. Under this management, the inflammation present at the time of the first visit was markedly reduced by the first treatment, and the moderate use of the part during the interval between treatment further helped in removing the exudation. By the time the second treatment was given, the exudate was probably relatively little. It may or may not be necessary to see the patient about a week later.

COMPLICATED PRIMARY ACUTE CONDITIONS

The presence of anomaly of development particularly a difference in facet facing or sacralisation of the fifth lumbar, may markedly alter the permitted joint motions and may interfere with recovery owing to the relative instability of the joint, with its consequent tendency to repeated injury. This type of case apparently gets along best on daily visits until the acute spasm is relieved. The restraint offered by adhesive may have to be left on longer than in the uncomplicated case. The application of articulatory and corrective forces must be dictated by the joint itself so that unless the anomaly is known from X-Ray, its presence may be recognised by a failure of the joint to react to the usual forces. In this type of case a re-direction of force is more important than an increase in force. In the same category as the anomaly is the case in which there is a difference in leg length. The placing of a lift in the shoe at the time of the first visit is not too often indicated. The effect of muscle contractions associated with the lesion may give an erroneous impression of a short leg. The measurement of the leg length as the patient stands after most of the muscle spasm has been removed is much more accurate. In the cases in which a lift is used, perhaps placed in the shoe at the second or third visit, the patient should be seen again in about 7 or 10 days after recovery from the acute condition. This permits a check of the whole picture and a determination of the need for continuing the use of the lift.

There may be need to increase the height of the lift or it may be wiser to leave it out entirely. Tasker's (8b) comment about rest to painful joints is particularly apt for cases in which there is a difference in leg length: "If we give rest to all structures in which pain is located, we help to fill the world with stiff joints and serous adhesions, to say nothing of the far reaching after-effects of these structural defects upon the functional activity of the nervous system. A differential diagnosis is required in all cases of painful joints to determine whether it is wise to disturb the physiologically protective mechanism."

Among other complications rather commonly found in acute low back pains is that of the disc syndrome. In view of the rather frequent recovery of patients from what seems a rather definite syndrome, it behoves us to be careful in our diagnosis and differential diagnosis.

The possible role of lesion changes contributing to pre-disc pathology has been discussed by Burns (20). That changes associated with the Still lesion

could weaken the ligamentous support in the area of the posterior longitudinal ligament is readily appreciated.

Magnuson (21) has stated: "Inasmuch as the joint capsule and ligamentum flavum are continuous and almost inseparable by dissection at this point, it may readily be appreciated that any swelling or inflammation around the foramen could narrow the canal sufficiently to cause pressure upon the nerve root. Moreover, any inflammatory condition within the joint or any swelling or thickening of the ligamentum flavum in conjunction with the joint capsule could spread by continuity to the root of the nerve."

Herniation of fascial fat (22), inflammation of Luschka's gland (23), radicular irritation in association with spinal arthritis (24) as well as spondylolisthesis may cause symptoms resembling those of a disc.

Concerning prolapses of the nucleus pulposus into the vertebral bodies (25), Schmorl states that from 18 to 59 years, 40 per cent of male spines and 20 per cent female spines presented the condition whereas after 60 years of age, 23 per cent of male and 44.3 per cent of female spines presented the condition. "Thus, there is a considerable excess of males during the early and middle periods of life, and an excess of females in the later. This is probably to be connected with the harder work performed by men in the active period. After the retiring age, women continue to be more active than men. There can be little doubt that this slight physiological trauma may be the deciding factor, the damage being too slight to be caused by anything more than quite insignificant mechanical shocks." (25a).

Beadle, discussing Schmorl's nodes also mentions posterior prolapse of the disc. "The cause of these posterior prolapses is presumably the same as in the central ones, namely degeneration and slight trauma" (2). On examination of 368 spines it was found that 56 showed these formations 15.2 per cent. These were "never seen under 30 and most of the cases are over 50."

While these figures might be subject to alteration the important point would seem to be that many people apparently have disc changes but these changes remain silent. On occasion they may be stirred up by strains which result in lesion pathology. Keegan (26) has stated: "The first sacral nerve is commonly affected in herniation of the 5th lumbar disc. The sensory ganglion of the root lies beneath the first sacral lamina below the disc and hence herniation compresses the nerve root to the sensory ganglion and distal to the motor ganglion cells in the spinal cord.

“Another peculiarity of the nerve root compression by herniation of the lumbar discs is the absence of so-called trophic manifestation in the distribution of the root as occurs when peripheral nerves are subject to irritation.

“When the first sacral nerve root syndrome appears, with loss of ankle jerk, it is impossible to attribute this to any extra-spinal bone pathology, as the first sacral nerve root is entirely intra-spinal until it enters the fixed first sacral foramen of the sacrum.”

In addition to the symptom of low back pain, the presence of a disturbance of reflexes becomes important. The great percentage of disc herniation occurs at the level of the fourth or fifth lumbar, in which event the patella reflex is not apt to be affected as it is supplied by the second and third lumbar and occasionally the fourth. The fourth and fifth lumbar nerves are concerned with the gluteal reflex, the first sacral with the ankle jerk and the second sacral with the plantar reflex (27). Coincident with these reflex disturbances may be the impairment of muscle strength. Often this manifests itself as a weakness or inability to raise the foot as in going upstairs.

The paraesthesia, usually a numbness, localized to the skin dermatomes of the various segments is more apt to be present in the disc cases than in the others, though this is not infallible. Hyperaesthesia may be present and indicates the presence of either disc or severe lesion pathology.

While coughing or sneezing may increase the pain in psoas involvement, it is also a frequent sign of disc protrusion. Heat applied to the low back will usually afford relief to sprain but will frequently accentuate the pain in the presence of a disc.

Of several tests that are advocated for determining the presence of a disc, the straight leg raising may be positive also in a sciatic irritation. The so-called Fabere-Patrick may be present in a simple sprain though pain on the contra-lateral side suggests disc. By placing the patient on his side the physician can apply slow specific forces to a given segment and determine whether rotation or latero-flexion aggravates or lessens the pain, and thus determine quite accurately the presence of herniation.

The radiograph will show a narrowing of the intervertebral joint space and such may implicate the protrusion of the disc substance or actual herniation of the nucleus pulposus. The mere presence of a narrowing space does not implicate the disc. This is frequently encountered in a

patient that has few if any symptoms of root irritation and many patients with the finding recover from the strain that necessitated the X-Ray. Radiographic evidence of a narrowing of the disc implies a much greater need for ligamentous restraint and muscular support than would be required with the usual architecture. This implies a greater tendency for minor stresses to assume the role of strains. These patients respond if particular attention is paid to the plane of the application of force. Articulatory treatment, slow stretching in a specific direction, frequently permits the necessary alteration of tensions that is gratifying to the physician as well as the patient.

SECONDARY ACUTE LESIONS

The question as to whether the development of acute infections and similar diseases is aggravated or precipitated by the presence of the Still lesion is not the province of this paper. It has been implied that it does. However, that changes occur in the spinal muscles is common knowledge. These changes are for the most part in the superficial muscles when they are of secondary reflex lesions (28). Judicious treatment of the musculature will permit a lessening of the spasm in these muscles. The effect on the physiology of the primary focus is to permit a variable period of relatively normal nerve impulses to act on the focus, thus lessening what Speransky has termed the neuro-dystrophic factor. The return of this tension is an indication for further treatment.

The interval between treatment is indicated by this return; in some instances this may be a matter of two or three hours, in others six to eight, and in others longer. In these conditions, soft tissue and gentle articulatory treatment are indicated. Corrective treatment, when given, must be very specifically and carefully administered. As in other conditions, the change in the tissues is the only guide, and is also an indicator. In many instances, the finding of osteopathic changes may help in supplementing the diagnosis that the usual procedures indicate.

SUB-ACUTE CONDITIONS

A continuation of the acute process, the organization of the exudate of the first stage of an inflammation, requires a different management than the acute process itself. There is not the violent accumulation of fluid and the problem becomes as much one of improving arterial blood supply as of

providing adequate venous drainage. Sub-acute conditions should be treated every other day (18, 14) or two or three times weekly (19). Inasmuch as the purpose in treating sub-acute lesions is to carry away the results of the exudative process and to prevent the formation of scar tissue, treatment of an articulatory and corrective nature is indicated more than soft tissue treatment. McCole (16b) has stated: "Our observation is that the spinal joint tissues regain their tone in from 4 to 6 hours after a specific adjustment. They do not approach their former state of contracture however, for from 12 to 24 to 48 hours. If we reach these tissues just after their return to tone, but before their return to abnormal tension, they will be in ideal condition to receive further adjustment."

While posture and developmental faults may modify the management of the sub-acute condition, they are usually more easily controlled than in the acute conditions. With failure of a patient to progress as expected, here, as in any other case, the physician should consider X-Ray or other investigation. In this event, the doctor should be able to foretell quite accurately what he expects the examination to show.

Particularly important in sub-acute and chronic conditions is the factor of focal infection. Generally speaking, it seems wise to treat these cases palliatively until the source of infection can be eradicated.

If soft tissue treatment is of first importance in the early or acute stages of an inflammation, articulation of the area is of first importance in the sub-acute phase.

As in the case of acute lesions, their continuation in the form of sub-acute pathology may also be divided into primary and secondary, with the primary being concerned with those processes at the site of the lesion *per se*. The secondary or reflex lesions in this group could be exemplified by the changes that occur in the spinal musculature as the result of sub-acute gall bladder disease. Correction of the existing spinal change will modify the progression of the gall bladder disturbance. The use of various means to help the organ carry on its functions, such as diet, fat-free or mild fat, as indicated; exercise, particularly forward bending; light palpation with the index finger making a figure 8 over the gall bladder area on the anterior abdominal wall; will help to lessen the abnormal impulses responsible for the spinal tissue changes. The correction of the associated lesions lessens the occasion for abnormal nerve impulses to disrupt the function of the gall bladder.

Speransky has stated (9): "The basic cause for the change in the tissues is the destruction of normal nerve conditions in a definite tissue region."

CHRONIC CONDITIONS

"In chronic conditions the first treatment should be very light, each treatment growing stronger until the operator has determined just how strong a treatment will produce the best results"(18). Correction of lesion pathology, which, in the chronic state is essentially a variously well organized fibrosis, is more important than soft tissue or articulatory treatment. This does not necessarily imply a vigorous breaking down of scar tissue at every visit. It has been advocated that preparation for the correction of these states in some instances requires considerable time and several visits. It is well to bear in mind that too much, too soon, is apt to result in a flare-up of symptoms. Particular attention must be paid to the relation of distant pathologies in the spine, the general health of the patient, visceral disturbances of a state of minimal physiological efficiency and other factors not necessarily manifest in the management of these chronic lesions. As the case progresses the interval between treatment can be lengthened. Whereas early in the treatment regimen the patient might be seen two or three times weekly, as improvement is noted, the interval may be increased to seven or ten days, then to two or three weeks, then probably monthly. The indications are, as always, the response of the tissues to treatment, for the length of treatment, amount of treatment, and the interval between treatments. Specific corrective technique then, afford the main purpose of treatment of these lesions. Inasmuch as there is frequently associated a constitutional element, a general treatment may be indicated, with the consideration that it may be wise to alternate the specific correction with a moderate general treatment and a treatment in which specific correction is rather minimal, with a proportionately greater amount of the time being devoted to the general treatment.

SUMMARY

The amount, duration and frequency of osteopathic treatment is determined by the condition of the tissues at the lesion site. Acute conditions require particular attention to the inflammation involving the muscles and ligaments. In sub-acute conditions, the establishment and maintenance of joint motion is the prime directive. In chronic cases, the removal of fibrosis demands the most attention. Tasker (8) has stated:

“We are continually impressed with one of the fundamental ideas in osteopathic practice, that the only measurable guiding quantity in giving an osteopathic treatment is the palpable tissue change, the lesion.”

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A STUDY IN STRUCTURAL DYNAMICS

MARVIN SOLIT

The object of this paper is to define and formulate a concept of normal body mechanics and to introduce a manipulative technique that will bring individual bodies toward this norm.

WHAT IS "NORMAL"

To properly understand and employ this 'normalizing' technique it is essential first to sharply define the term 'normal.' I feel that the failure to discriminate between 'average' and 'normal' has been a major stumbling block in the progress of the healing arts.

As students in our first years of medical school, we were taught so-called normal anatomy, normal physiology, normal body mechanics, and so forth. We examined and experimented on fellow students who were generally assumed to be normal. This was based on the assumption that only with a knowledge of the normal can the abnormal be diagnosed and treated. Although the principle is sound, it was not brought to our attention that what we were labelling 'normal' was, at best, a 'better than average.'

There are two basic weaknesses in the conventional approach to determining 'normal.' First, the criteria for acceptance in the normal test group are vaguely or arbitrarily defined. In actual practice, the absence of disease and/or symptoms (at least in the particular area under study) is the prerequisite for acceptance in the normal group. This is difficult if not impossible to measure. Second, the final results of the testing are reduced to statistical averages which fail to recognise the uniqueness of the individual.

Admittedly, this present technique has been well accepted and is useful; nevertheless, there exists today a confused picture of exactly what is normal. Thumbing through medical literature, one finds wide disagreement among different authorities in almost every area of research.

For example, in the study of body mechanics and kinesiology one can find recognized authorities supporting all of the following points of view:

1. In normal standing the feet should be (a) toed out at a 30 degree angle (1), (b) parallel (2).

2. A perpendicular line through the centre of gravity should fall in the midline (a) between the ball and heel (3), (b) 1 cm anterior to the ankle joint (4), or (c) through the ankle joint.

3. Weight-bearing forces should be distributed predominantly (a) on the lateral aspect of the foot (5) or (b) on the medial aspect of the foot.

4. The spinal curves should be (a) as shallow as possible, or (b) “One may accept as normal a higher degree of lordosis of the lumbar spine so long as it is compensated by a commensurate kyphosis of the dorsal spine, and so long as the line of gravity continues to intersect the spinal column at the conventional levels and so long as it still falls between hip and sacroiliac articulations.”(6)

5. In regard to gross mechanics, some authorities distinguish attitudinal types of normal, such as relaxed normal and military normal (7), and body types such as mesomorphic, ectomorphic, and endomorphic normals. (8)

The problem of ‘what is normal’ is recognized in many other aspects of medical research. For example, when computing normal values in laboratory chemical tests it is necessary to consider not only body type but also diet. Normals for total serum cholesterol in Orientals, who subsist on fish, rice, and vegetables, is 120 to 160mg per 100cc, which is a far cry from the accepted 200 to 250mg per 100cc for Europeans and North Americans, whose diets are richer in proteins and fats.

Happily, the confusion, disagreement, ambiguity, and semantic fuzziness that pervades medical literature is reduced when concepts can be expressed in physics and mathematics. It is for that reason that I use a physical-mathematical framework for defining normal. Only two normals are differentiated

1. Absolute normal – a theoretic human functioning that represents the most efficient usage of energy. It is essentially a physical-mathematical model of man which does not exist in nature.

2. Relative normal – a functioning that for each individual represents the most economical performance of his own body. In this definition one can investigate and determine individual rather than group norms. One can compare the individual, not to other individuals and groups, but to his own normal and his own efficiency potential.

One can refer to the most economical functioning of each body as normal, using the following five points as criteria:

1. Movement is performed with minimum work, that is, minimum energy expenditure.
2. Motion can be initiated in any direction with maximum ease and speed.
3. Movement can start with minimum preliminary adjustment of the body.
4. Structure is appropriate to the most adequate functional position of internal organs and the nervous system.
5. There is minimum 'wear and tear' on the parts of the body.

(Points 1, 2, and 3 were suggested by M. Feldenkrais in '*Body and Mature Behaviour*' (9).

PHYSICAL EVOLUTIONARY TRENDS

In constructing this 'normal' it must be acknowledged that our present bodily form has 'proved' itself by its survival record. I feel that it would be practical to consider the trends in man's evolution and to examine the material uncovered by anthropologic studies. The trends through fossils, anthropoids (gibbon, gorilla, and so forth) to Heidelberg man, to Neanderthal, Cro-Magnon, and to modern man, show certain general modifications which may be summarized as follows:

General stature. The trend has been from semi-erect to erect. This was partially accomplished by the spinal curve going from a large 'C' curve anteriorly to a spine with three smaller alternating curves (Fig. 1, a, b, and c). A line passing vertically through the centre of gravity has moved progressively back from the toes in the direction of the heel. While the height has been increasing very gradually, the weight has remained relatively unchanged.

Skull. The long oval shape has become more spherical (brachycephalic), more gracile, lighter, and smoother. The base of the skull has changed from an almost vertical position to a horizontal position. The jaw bone is becoming smaller with fewer molars. The over-all capacity of the skull has not increased appreciably; thus the brain has not increased much in actual size, but probably has changed in the relative proportions of its areas.

Chest. The ribs have become gracile and lighter. The external muscles of respiration (serratus anterior and serratus posterior, pectoralis major and

minor, and so forth) have a lesser role in respiration, while the intercostal and the diaphragmatic muscles play a greater part.

Shoulder and neck. The neck has become longer and less thick, with greater range of motion, and the shoulder lighter and less muscular; bony (clavicular) attachments to the frame of the body give greater motion and ease of use. The placement of the scapula is becoming more lateral.

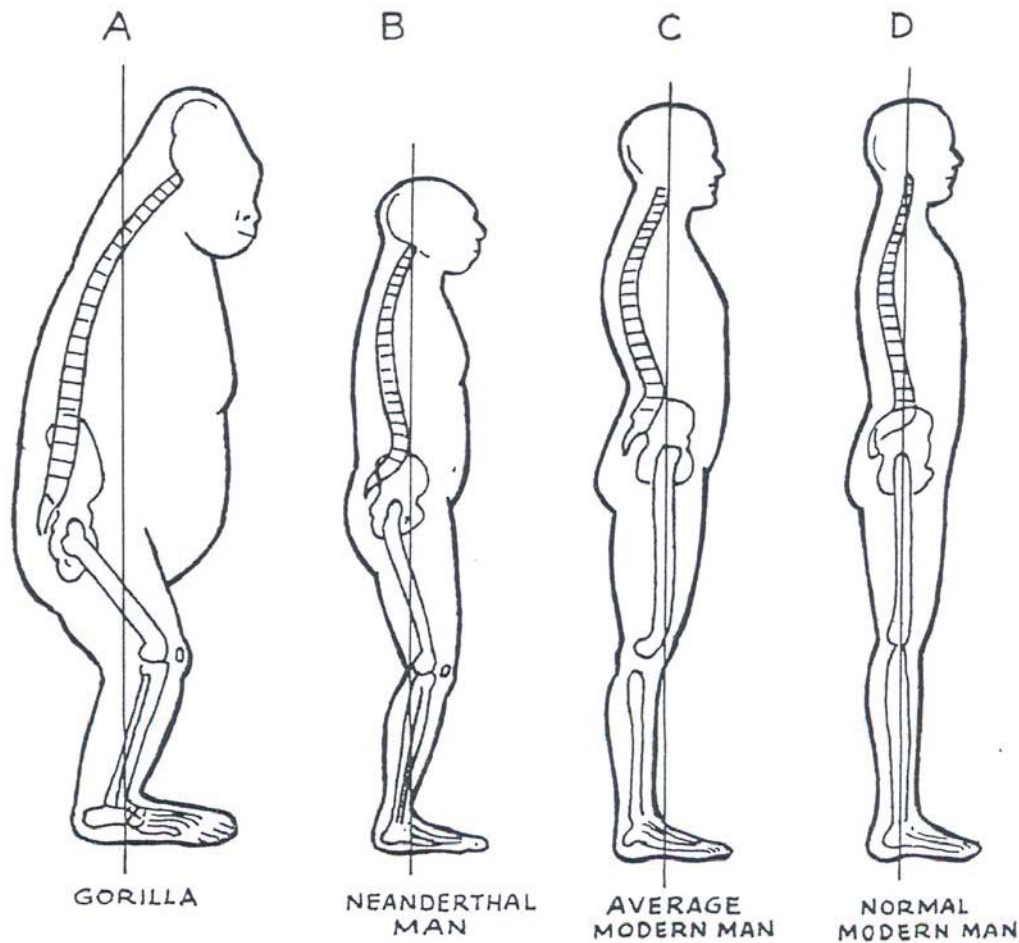


Fig 1

Pelvis. The trend in the pelvis is for less anterior tilt. The outlet of the birth canal is slightly enlarged. The pelvis is becoming wider and shorter.

Internal organs. Although it is impossible to determine what alterations have occurred in the internal organs, it can be inferred from the body skeleton that the position of the organs has changed from an actual

hanging from the spine (like clothes on a line) to a suspension of the organs closer to the backbone.

Thigh bone. The thigh bone has become longer and straighter, with more of an adduction position.

Bones of the leg. Both the tibia and fibula are becoming longer and straighter. The fibula is becoming less robust and playing a decreased role in weight-bearing. The tibial plateau is becoming less retroverted and more horizontal.

Bones of the feet. The heel bone is increasing in size progressively and pressing closer to the ground. The first metatarsal has become longer; it and the second, third, fourth and fifth metatarsals are settling closer together, with less range of motion. The inner arch is becoming more prominent and is assuming more weight-bearing. The toes are shortening, with less motion (Fig. 2). The feet are going from a position of inversion to one of eversion.

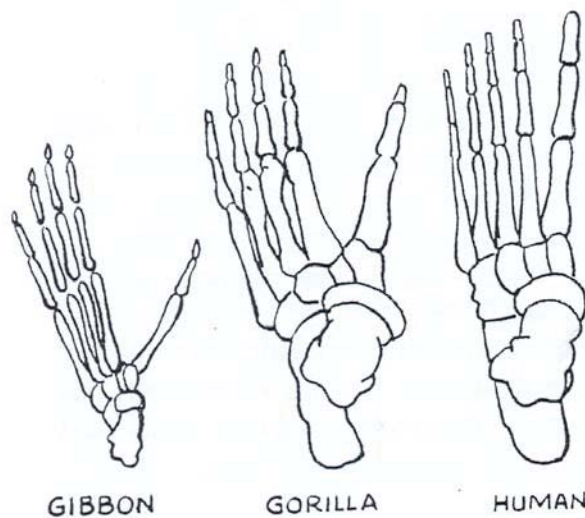


Fig 2

These are the trends in general, but carrying these trends beyond a certain point requires compromises. For example, if the skull and brain capacity increase substantially, the organic structure will require a larger birth canal (to facilitate childbirth), and consequently a larger pelvis.

The so-called law of squares and cubes formulates what is observable in organic change, notably, that if the shape and proportions of any material body remain the same but the size varies, its strength increases as the square of any one dimension, while its weight increases as the cube. Accordingly,

increasing the size of the pelvis, or any other bone, can conform with this formulation only through intricate compensations. For example, a heavier pelvis would require heavier thighs and legs; and if the height of the centre of gravity is measured as a vertical distance along an axis from the bottom of the feet to the top of the head, this in turn would lower the centre of gravity and increase the moment of inertia. But in order to satisfy points 1, 2, and 3 in the formulation of normality, the highest possible centre of gravity and the lowest possible moment of inertia around the vertical axis would be desirable. With the highest possible centre of gravity compatible with the structure, and the minimum moment of inertia, the body is poised at its maximum potential of energy level, and it can move in any direction with a minimum of energy expenditure.

NORMAL STRUCTURAL DYNAMICS

The following description will be found to satisfy the requirements for normal, if normal is defined as ‘most economical functioning.’

1. Viewing the body in profile, a vertical line through the centre of gravity can be seen as falling through the major joints—ankle, knee, hip and the atlanto-occipital junction. The three spinal curves (cervical, thoracic and lumbar) should be minimal, but flexible throughout, and the spine will have no flat areas (Fig. 1d).

2. The shoulder, consisting of the scapula and clavicle, functions independently of the chest wall, with the clavicle attached to the chest only at the breastbone and functioning only as a strut to keep the shoulder joint at its most lateral position.

3. The bones of the lower extremities—the tibia, fibula and foot bones—act as a unit, so that in standing and walking there is a maximum of translational motion (motion with minimal rotation of the parts) and the general direction of motion is in a plane parallel to the medial plane of the body.

4. The ‘weight’ of the body is distributed as close to the vertical line as possible going through the centre of gravity. An analysis of weight distribution on the feet would reveal that the calcaneous area supports the maximum weight, with the lateral longitudinal arch supporting practically no weight.

5. The position of the pelvis is as vertical as possible. A pelvis is considered vertical when a horizontal plane goes through the anterior and posterior spines of the ilium (Fig. 1d).

6. As the arrangement of the bones assumes a more stable relationship with the 'forces of gravity,' there is a structural modification of the muscle-fascia units. The active contractile elements (actin, myosin and so forth) become reduced in quantity, resulting in a relative increase in the fascial elements. The more balanced the body, the more it is supported by the antagonistic pull of the fascia.

(Using words like 'muscle' and 'fascia' as if they exist as separate entities creates a separation which does not exist clearly in nature. Medical students in their anatomy dissection can attest to this, as they find it extremely difficult to 'clean' a lower extremity muscle. The fascia does not cleanly strip away from the muscle and bone, and the final separation depends to a large extent on the preconceived formulations of the dissector. The term 'muscle-fascia' considered as a functional unit more accurately describes the situation.)

In considering the musculoskeletal system of this 'normal' body, the following points are apparent:

1. There is a greater opportunity for 'independence' of action by the major parts of the body, such as head and neck, chest, shoulders, pelvis, and lower extremities. For example, the movements of the head and neck can operate without necessarily involving gross movement of the chest or shoulders. The shoulders and arms can function without involving the chest. The pelvis can rotate and twist without disturbing the parts above it. The rib cage has been freed to function mainly for respiration and need not be involved in the tasks of other parts of the body. Elevation of the emancipated ribs (in inspiration) can easily be accomplished by the contraction of the intercostal muscles, and expiration achieved by a simple relaxation of the intercostals, allowing gravity to do the work.

2. The tendency toward specialization of parts is exemplified by the development of the nervous system. The central nervous system and the brain, together with the bony spine and cranium and the muscles of the spine (suboccipital, interspinales, rotatores and multifidus), can be considered as a complete and integrated unit. This unit occupies the area of the body which can be considered the longitudinal core-the area least affected by gravity-and it is to a degree functionally independent of the rest of the body. This unit is now structurally best able to perform its functions.

3. This musculo-skeletal arrangement allows the heart and other viscera to be suspended close to the spine, rather than to have an anterior and inferior sag.

Recalling that the specifications for the 'normal' body involved considerations of movement, energy expenditure, and the like, one must test the normal body, not in a static standing position, but in movement. Locomotion, one of the body's most important acts, should be a good test.

Starting from a standing position with the body at its maximum height and highest centre of gravity (maximum potential energy), movement is initiated by the forward movement of the head. Practically simultaneously, the movement is followed by the long extensor muscles of the back (sacro-spinalis) stretching and lengthening as the psoas and iliacus contract and easily swing the femur and consequently the entire extremity forward. The foot skims along the ground with the heel rising very slightly to help maintain the body at its maximum height. (This action of the sacro-spinalis, psoas, iliacus and corresponding fasciae allows the lumbar curve to straighten and the pelvis to extend, which also lengthens the body).

The entire extremity moves directly forward with a minimum of rotation of the parts. Traces left by the feet are parallel and reveal a narrow base. The lateral weight of the body is close to the medial plane in every part of the walking cycle; so transfer of weight to the opposite side requires minimal muscular activity, and is also accomplished primarily through the utilization of 'gravity.' The head, chest and pelvis, during the walking cycle, sustain minimum vertical movement and maximum translational horizontal movement.

To answer a reader who may feel that this way of walking is too simple to really work, I cite the work done with artificial limbs. Experience with artificial lower limbs tends to substantiate the simplicity of walking, for these prostheses of wood and metal have no arrangement for muscles (other than for the stump of the thigh which fits into the hollow of the prosthesis), and the ankle and knee are simply hinge joints - yet these devices work very efficiently as a substitute for the more complicated human extremity.

We see that 'normal' walking requires a minimum of work and consequently a minimum of energy expenditure. Motion is accomplished with maximum ease and can be initiated with a minimum of previous adjustment of the body. The internal organs are in their best functioning

position at all times, and there is the least possible wear and tear on the body as a whole.

There are at present numerous methods for measuring body movements. Most of the standard techniques involve photography. I am personally familiar with the multiple image technique used by Dr. Franklin Pierce Jones⁽¹⁰⁾ and his associates at the Institute for Applied Experimental Psychology at Tufts University. With this technique the subject is dressed in dark clothing, and white strips are attached in strategic areas indicating the zygomatic arch, the seventh cervical vertebra, the sternal notch, the lateral aspects of the arm, forearm, thigh and leg, and the sole of the shoe. The subject walks along a ramp in a darkened room and the pattern of movements is recorded on a colour film by the Strobolume flashing at 10fps and coded by a colour wheel revolving in synchrony.

This method is useful because it gives a record of the motion of all the parts simultaneously, but the detailed measurements and calculations, such as velocities and accelerations, are painfully laborious and time-consuming.

Locally, North-Eastern University's Department of Mechanical Engineering has been experimenting with a more recent technique using small accelerometers attached to different areas of the body. The accelerometers can give rapid, accurate direct measurements of acceleration, velocity and displacements. This technique has the disadvantage of requiring the attachment of the equipment to the subject, which in itself slightly modifies the motion pattern. Ideally, a technique should not restrict the subject in any way, and should at the same time compute and reduce data with a minimum of effort.

There are two basic weaknesses in the conventional approach to determining 'normal.' First, the criteria for acceptance in the normal test group are vaguely or arbitrarily defined. Second, final results of testing are reduced to statistical averages which fail to recognise the uniqueness of the individual.

TREATMENT BY POSTURAL RELEASE

Consideration of the 'normal' which I have outlined suggests the need for a practical therapy which will bring individual bodies closer to these norms. The technique which I have found most effective in achieving this end is the manipulative system devised by I. P. Rolf (12) which is called Postural Release. To give the reader an understanding of the principles and procedures involved in Postural Release, I will describe in detail the 'processing' of a specific patient, from the initial evaluation to the final treatment, including appropriate comments on this therapy in general, which may help to clarify certain points.

CASE 1. The chief complaints of this 38-year-old woman were:

1. Low-back pain, with an onset 6 years ago, progressively increasing in severity. X-rays taken the previous year showed evidence of lower lumbar osteoarthritis.
2. Stiffness of neck and 'tight shoulders', associated with suboccipital headaches.
3. Shortness of breath particularly noticeable when participating in activities which previously were not a strain.
4. Pain under the metatarsal area of left foot and frequent cramping of calf muscles of the right leg.

The physical examination showed that her weight was 149 pounds (there had been no change in the past 10 years) and her height was 5 feet 6 inches. Heart and lungs were essentially negative. The blood pressure was 108/60, and pulse rate was 76.

Gross structural evaluation (Fig. 3) showed anterior pelvic tilt, lordosis, depressed chest, bilateral hammer toes, and hallux valgus grade II. It is interesting to note that although the patient was not obese, she had areas of marked disproportion, namely the gluteal area, abdomen and thighs. The range of motion of all joints was limited. The patient was a belly breather and her costal respiratory movements were markedly restricted.

A photographic record was made. For this purpose, I routinely used a 35 mm Retina reflex camera and a Polaroid Land camera, taking front, back and lateral views at a distance of 10 feet. Patients are asked to stand comfortably and in a relaxed posture for all pictures. The 35 mm camera is best for detailed examination and for making enlargements and slides. The

10-second Land camera serves to give the patient an immediate appreciation of his problem and an understanding of what is involved in straightening it out. In addition, the postural changes occur rapidly during treatment, and these changes can be readily seen in the pictures taken before and after each treatment.



Fig 3

It was apparent that this patient was operating far below her level of maximum efficiency. Recalling the criteria for normal, the respective centres of gravity of the gravitationally significant parts of the body – head, chest, pelvis and lower limbs – should fall in the line of gravity; when this happens the entire system is in equilibrium. The translatory and rotary components of the gravity forces are negligible.

The centres of gravity of the significant parts of this patient's body did not fall in the line of gravity, and the disorganizing tendencies of the gravitational forces had to be equalized by other forces, namely the myofascial elements of the body. The myofascial elements, which in the normal body are used mainly for body motion, would now be required to take on the additional job of body support. It should not be surprising that a closer examination of this patient revealed that these compensating

structures and muscles, including their tendons, fascial sheaths, and ligaments, were shortened, thickened, rigid, displaced and inelastic. The normal muscles should slide easily in their fascial sheaths while shortening and lengthening, much as a piston moves in its well-oiled cylinder. The patient's body could be likened to a 'muscle machine' that was not 'hitting' on all its cylinders. It sorely needed a tuning, cleaning and lubrication. To quote A. T. Still: 'The fascia is the place to look for the cause of disease, the place to consult and begin the action of remedies in all diseases even though it be the birth of the child.' (13)

In describing the actual treatment, descriptive words such as 'corrective movement,' 'normalization,' and 'manipulation' are used. It is implied that the therapist has examined the area under consideration both visually and by direct palpation to determine the precise area of restricted movement and tight, strained, displaced myofasciae. These areas feel knotty, hard, and even gristly, and are tender to the touch.

When a joint is grossly put through its range of motion the specific trouble areas will demonstrate maximum limited motion. Muscles and tendons in these areas feel 'bunched up,' and deep palpation reveals a lack of differentiation of structure. The subtle individual movements that characterize a well-working normal area are diminished or absent.

Once these areas are located and evaluated, the therapist, using his fingers, clenched fist, forearm, or even elbow at times (depending on the degree and type of force necessary), exerts pressures in specific directions until these areas show signs of change—less ropiness, appropriate lengthening, and so forth. Repeating the joint movements will then show increased ease of motion.

The patient's individual treatment programme consisted of a series of ten manipulative 'processings.' Each processing was of approximately one-hour's duration, and each one was a definite step toward recreating in the body a more normal pattern of movement and posture.

1. The immediate goal of treatment one was the improvement of respiratory movements to help increase general tissue oxygenation. This facilitated the rest of the tissue responses to manipulation. The patient's chest was restricted by the shortened, tightened auxiliary muscles of respiration, specifically the pectoralis major and minor and the serratus anterior. The abdominal muscles, as they attach to the lower ribs and sternum, were also involved. After working on these areas there was an

immediate increase in the respiratory rib movements. The patient noticed an immediate ease and freedom in her breathing.

The remainder of the treatment was concerned with increasing the mobility of the pelvis to enable it to function more independently of the chest above and the limbs below. This necessitated manipulation of the muscles around the hip joint, especially the gluteals and tensor fasciae latae. This procedure, plus lengthening the rectus femoris, allowed the pelvis to decrease its anterior tilt. The patient could feel that her sway back was flattening out.

2. The goal of the first 2 hours was the mobilization of all the superficial fasciae and muscles. The superficial fascia is the bridge connecting the corium layer of the skin to the deep fascia. This bridge must be crossed manually to reach the deeper structures.

During the second hour's treatment the feet and legs were worked on first. The patient's 'hammer toe' condition was the result of her using her toes as a support to prevent her anteriorly imbalanced body from falling further forward. The extensor hallucis longus and the extensor digitorum longus and brevis, as well as the calf muscles and plantar fasciae, were involved with body support, and were strained, shortened, and even fibrotic. After working on these areas, in addition to generally reducing the anterior body tilting, the patient stated that her feet felt lighter and less tender.

In general, I have found that in the manipulative correction of the gross body mechanics, foot problems such as hallux valgus, hammer toes, calluses, metatarsalgia, and flat feet can be significantly improved to the point where special shoes and orthopaedic appliances are no longer necessary, this has been especially gratifying, for many of the orthopaedic appliances and devices that are designed to improve a local area do so by redistributing body strains rather than by correcting them. For example, a foot plate or inner sole wedge may decrease the symptoms for which it is prescribed, but in terms of gross body mechanics it essentially lateralizes the weight distribution and creates a less efficient and more strained body. It is not generally appreciated that the readjustment of one area may be the direct cause of trouble in a distant area of the body at a later time.

3. As the patient put her shoulder joint through its range of motion, there was a markedly restricted movement of the entire shoulder girdle. The scapula and clavicle acted as though they were tied down to the chest wall. The areas of restriction involved the rhomboids, teres, and latissimus dorsi

muscles. As these areas were worked on, the stiff shoulders noted at the patient's initial examination became less stiff.

The lower back muscles, especially those attaching around the crest of the ilium, were very rigid, particularly the quadratus lumborum. The lumbar vertebrae were not only individually in lesion, but the entire lumbar spine was jammed together. It behaved like one solid block of bone, rather than as individual vertebrae capable of independent motion. The ability of the spine to lengthen during activity, which is a fundamental characteristic of normal spinal mechanics, was absent. Working on the above-mentioned muscles and the sacral spinalis group improved the gross spinal motion. The low back pain, which had diminished after the second hour's treatment, significantly subsided after this hour's processing.

The fourth hour's processing involved lengthening and balancing the adductors of the lower limbs. The adductor magnus, brevis, minimus, and the gracilis and pectineus originate on the ischio pubic ramus and are inserted on the linea aspera of the femur. It is necessary to lengthen these muscles in order to decrease the anterior pelvic tilt and restore pelvic balance.

5. The detailed description of the normal body mentioned that there should be an independence of motion of the pelvis and chest. Looking at the patient at this time, this motion seemed to be prevented by the abdominal muscles.

As one looks at a patient's protruding abdomen, one might think that the abdominal muscles were weak, and that the treatment should be geared toward strengthening them. By palpating the abdomen, however, one would not feel the flabby, atonic muscles which would be the evidence of the weakness; rather, the muscles are tight, bunched, and shortened. This should not be surprising, because here again is an example of muscles working overtime, maintaining body equilibrium. In addition, these muscles are supporting the sagging viscera, which normally would be supported by their individual ligaments. As the abdominal muscles are freed and lengthened, there is a general elevation of the rib cage, which in turn elevates the head and neck. It is customary to hear patients say, at the end of this hour, that their necks feel less strained and it is easier to stand tall.

The ramifications of the experience gained from freeing the belly walls carry over into the field of physical education. With the recent emphasis on 'health through physical fitness' programmes, millions of people are

undertaking physical fitness regimens. The majority of exercises in these regimens are designed to tighten and strengthen the abdominal muscles. During the past 3 years I have conducted callisthenic and posture classes at the Boston YMCA, and I have had an opportunity to study many people who have been practising abdominal strengthening exercises. While it was evident that they were hardening the abdominal wall, it was also evident that many of them were not successful in reducing their 'pots,' and almost all of them had succeeded in pulling down their chests.

The explanation for this relates directly to the anatomy and kinesiology of the abdominal muscles. These muscles are attached to the chest above and to the pelvis below. The direction of pull of any muscle depends on the relative degree of fixation of the bony muscular attachments. As the pelvis is the more immobile end of the muscle, and the ribs the relatively unfixed end, a shortening and tightening of the abdominal muscles will pull the ribs down.

In this patient's 'after' photographs (as well as in those of the rest of the cases), it is evident that the bellies become less prominent when 'processed.' These changes are produced without weight losses or muscle-strengthening exercises.

6. This hour involved the organization and integration of the muscles of the lower limbs, balancing the rectus femoris muscles with the extensors (the hamstring muscles), balancing the anterior tibial muscles with the posterior tibials, and balancing the adductors with the abductors.

These muscle groups are considered to be integrated and balanced when contraction of one set of muscles results in the instantaneous lengthening of its antagonist muscles, and vice versa.

It is at the completion of this hour's treatment that there is significant improvement in such conditions as pronated and everted feet and bowed and knocked knees.

I am continually impressed with the fact that these are not just foot or knee problems, but involve correction of over-all body mechanics. For example, pronated, everted feet are usually associated concomitantly with an anterior pelvic tilt; lumbar lordosis often accompanies internally rotated tibiae.

7. It was apparent at this time that the patient's head and neck were still too far forward. The neck muscles, especially the anterior muscles—scaleni, sternocleidomastoid, and strap muscles—were shortened. The posterior

neck muscles, including the semispinalis capitis, splenius capitis, trapezius, and suboccipital muscles, took on the role of preventing the imbalanced head and neck from falling forward. As a result, these muscles became overly tightened, restricting neck motion further.

The manipulation of the myofasciae of the neck is especially important, as these fascial planes are the 'highways' for the many arteries, veins, and nerves in this area. The deep fasciae which originate on the baso-cranium, superior nuchal line, and mandible, surround all the muscles, arteries, veins, and nerves of the neck, and continue to the mediastinal partition, the pericardial envelope, and the central tendon of the diaphragm.

The patient's suboccipital headaches, shortness of breath, and neck and shoulder stiffness showed considerable improvement after this hour's treatment.

8 and 9. These two treatments involved processing the same areas of the body as the third and fifth hours, with this exception: with the improvement of the superficial layers, I could now reach the deep myofascial layers.

For example, the lumbar lordosis and anterior pelvic tilt to a large extent were being held in their mechanically compromised positions as a result of the pulling and shortening of the psoas and iliacus muscles. Lengthening these muscles through the anterior belly wall significantly improved the pelvic and lumbar vertebral mechanics.

It was interesting at this point to see the patient's ill-proportioned hips assume a more desirable contour. For the first time in her life, the patient was now aware that her figure problem was not a problem in weight, but rather of posture and balance.

10. The final treatment involved a general over-all balancing of the body. Special attention was paid to freeing up the entire length of the spine to the point where the spine was flexible and could lengthen from the first cervical to the fifth lumbar. Flexion of the neck should produce a wave of motion that travels uninterrupted down the spine to the sacrum.

As it is generally acknowledged that 'disk' lesions are largely the result of disk compression, the attainment of the tenth-hour goal is a significant step in both the prevention and treatment of disk disease.

The 'after' picture (Fig 3 right) shows graphically the final result of the therapy. The patient felt as well as she looked, and except for an occasional headache, was asymptomatic. Routine rechecks 6 months later and 2 years

later showed that the patient was continuing to enjoy good health. The original blood pressure of 108/60 climbed to 118/78 and remained in that general range. The weight remained constant at 149 pounds.

CASE 2 - A 15-year-old girl had chief complaints of (1) postprandial epigastric pain, nausea, and vomiting, relieved by lying down (gastrointestinal X-ray study at the Massachusetts Osteopathic Hospital showed delayed emptying time, probably due to external pressure on the duodenum); and (2) frequent 'colds' in the neck, and neck stiffness. Physical examination showed an ectomorphic type build with lordokyphosis, genu recurvatum, pronated and everted feet, and visceroptosis (Fig. 4).

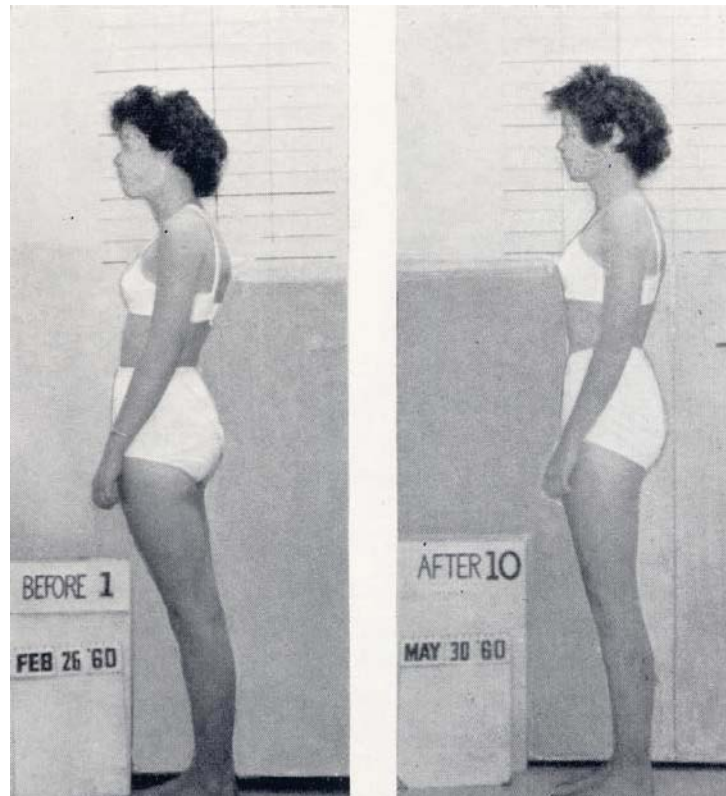


Fig 4

The diagnosis was mesenteric drag syndrome (arterio-mesenteric occlusion), with poor body mechanics, especially visceroptosis and lordosis. The intermittent type of duodenal obstruction was considered to be caused by compression of the third portion of the duodenum between the root of the small bowel mesentery and the lumbar spine. The patient did not respond to the conventional medical regimen of dietary changes and drugs.

In constructing the 'normal' it must be acknowledged that our present bodily form has 'proved' itself by its survival record. The trend in man's evolution has been from semi-erect to erect. A line passing vertically through the centre of gravity has moved progressively back from the toes in the direction of the heel.

The patient received 10 hours of myofascial processing between February 27 and May 20, 1960. Her symptoms subsided and she had no recurrence.

The most interesting aspect of this patient's treatment was the emotional abreaction she had while I worked on her rigid, even spastic, abdominal wall. This child came from an extremely stern, rigid home and she attended a strict parochial school. Even when she laughed, one could see that her laugh mechanism was indrawn rather than expansive, and thus was not a form of release. In addition to the subsidence of her gastro-intestinal symptoms, there was a significant personality improvement, as noted by her parents and teachers.

In constructing the 'normal' it must be acknowledged that our present bodily form has 'proved' itself by its survival record. The trend in man's evolution has been from semi-erect to erect. A line passing vertically through the centre of gravity has moved progressively back from the toes in the direction of the heel.

CASE 3. A 20-year-old man (Fig 5) had chief complaints of (1) pain in the right side of the chest, and (2) loss of weight and night sweats.

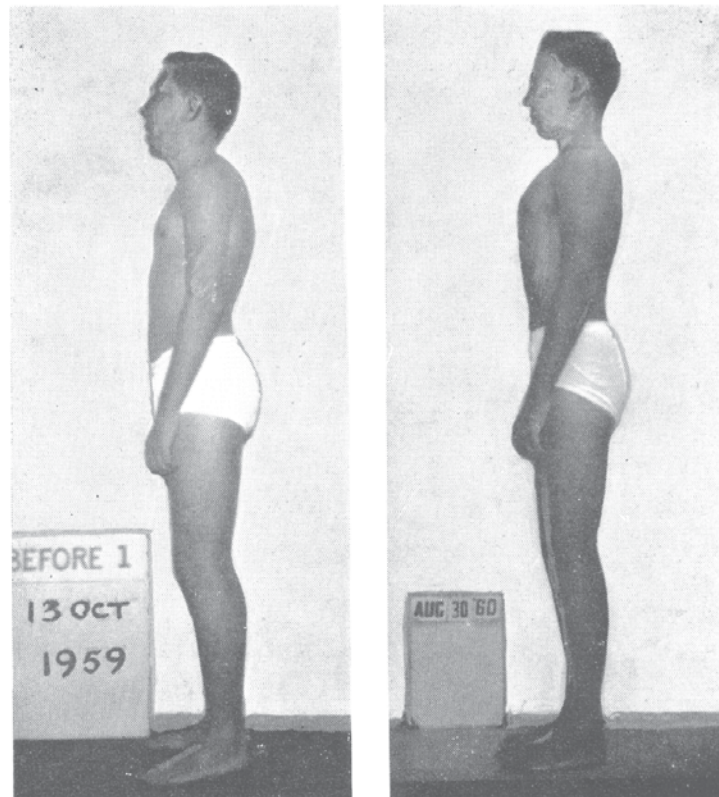


Fig 5

He was admitted to Boston City Hospital on May 19, 1959, with a positive culture for tubercle bacillus. An X-ray study showed increased pleural density in the right lower chest. The diagnosis was tuberculous pleurisy with effusion. The treatment was para-aminosalicylic acid, 600mg, and isoniazid, 24 grains daily. From May 19 to September 26, 1959, there was no objective or subjective change.

On October 13, 1959, the patient joined the author's callisthenic posture class at the Boston YMCA. Within 3 weeks his chest felt easier and he stopped the medication. An increased dosage had been making him nauseous, and the patient felt that it was not helping him.

On November 15, 1959, the patient started postural release treatments. X-ray examination on February 2, 1960, at Boston City Hospital showed resolving of pleural fluid levels.

The patient completed his myofascial processing on March 10, 1960, and at that time reported no objective or subjective symptoms. Re-examination 6 months later (Fig 5 right) found the patient feeling well and having gained 10 pounds. X-ray examination on January 18, 1961, showed normal pleural density and a tent adhesion of right diaphragm.

This case reaffirms in my own mind the osteopathic understanding that there is more to the treatment of the infectious diseases than trying to destroy the germs (the so-called causes) with antibiotics.

CASE 4. The case of an osteopathic physician, aged 60, is worth describing although there was no serious 'chief complaint,' except for an occasional dull ache in the lower back. This man, although asymptomatic, recognized the importance of structural integrity and understood that he could undergo therapy as a preventive measure.

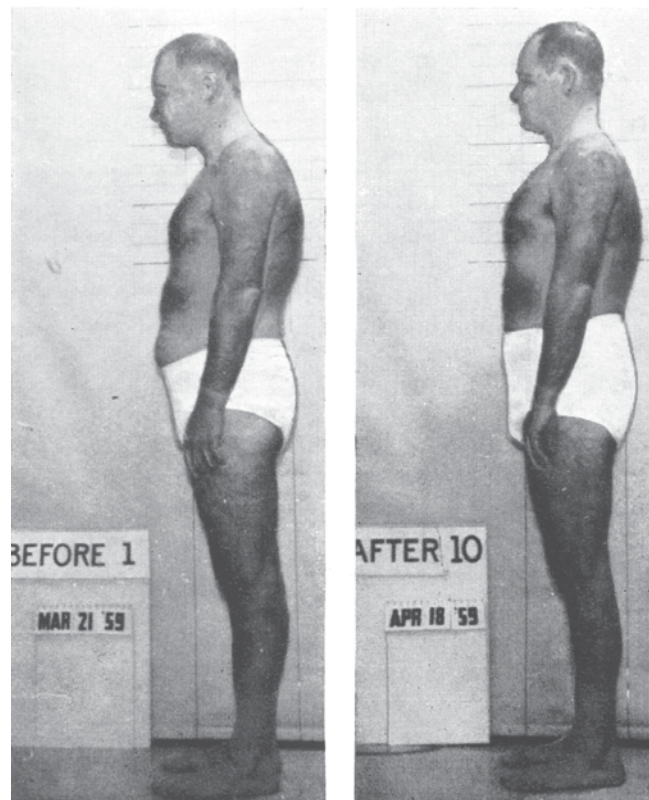


Fig 6

From the accepted medical evaluation this patient would be considered 'normal.' However, from the definition of normal outlined in this paper, it was apparent that he was functioning far below his potential ability (Fig. 6 left). As he approached his normal (Fig. 6 right), he reported that he was feeling less fatigued and in general felt more energetic and alert. His only 'complaint' concerning the therapy was that he had had to have his suits altered.

CASE 5 - A 68-year-old man had numerous complaints, involving practically every system in his body: (1) recurrent shoulder and low-back pain; (2) generalized joint stiffness; (3) low-back pain radiating into anterior lateral aspect of the right leg, below the knee; (4) exertional dyspnoea; (5) nocturnal urinary frequency; (6) diminished hearing; and (7) occasional heart "flip-flops" (to quote the patient).

The diagnoses were: (1) generalized myo-fibrositis; (2) lumbar arthritis (X-ray showed lumbar facet joint arthrosis and spondylosis); (3) fifth lumbar nerve root irritation (x-ray showed that the disk between the fourth and fifth lumbar vertebrae was narrowed); (4) bilateral shoulder bursitis (X-ray showed extensive calcarea); (5) premature extrasystole and generalized arteriosclerosis; (6) tympanic membrane sclerosis; and (7) benign prostatic hypertrophy (the patient had been under care at the Lahey Clinic where surgical treatment of this condition had been suggested).

Between August 1 and October 18, 1958, the patient underwent 10 hours of myofascial therapy. He experienced improvement of his generalized stiffness and shoulder and back pain. The nerve root pain subsided but areas of hyperesthesia persisted. The patient stated he felt less fatigued and had no difficulty breathing in exertion. In addition to the physical improvement, there were marked changes in his attitude towards his body. He recognized that his symptoms and conditions were not just due to "old age", and he did not have to "learn to live with them."

He was placed on a high protein, low carbohydrate diet and a comprehensive supplemental nutritional regimen. Also, he was given a series of special callisthenic exercises designed to further improve his body balance and usage.

When the patient was seen a year later he felt and looked even better and his areas of hyperesthesia had disappeared. On January 5, 1959, he had undergone operation at the Lahey Clinic for a solitary thyroid nodule, which was found to be benign. He also had two episodes of bursitis, which

subsided easily. The patient underwent a second series of treatments from September 3 to November 1, 1959.

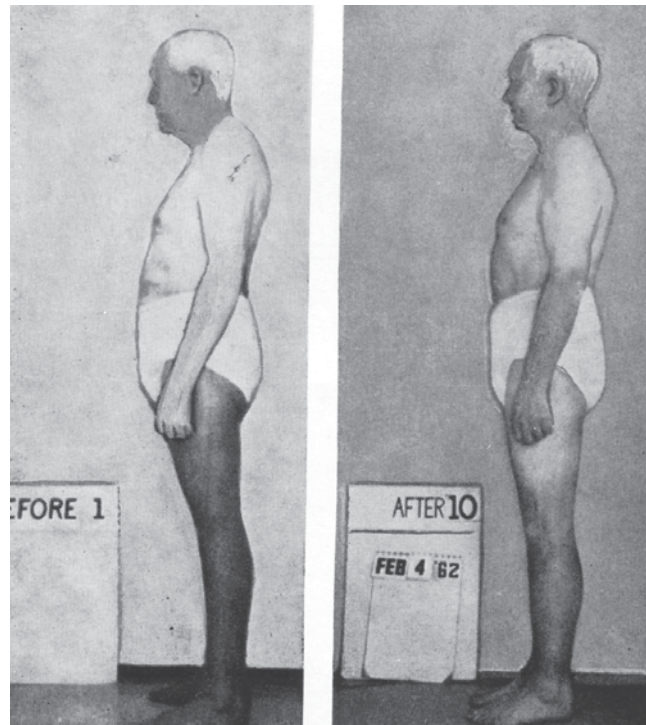


Fig. 7

During 1961 the patient, then 71 years old, was feeling well and pain-free, and his urinary symptoms subsided. At a recent Lahey Clinic check-up for his prostatic condition, the patient was told that the area was now normal and required no treatment at present.

SUMMARY

As physicians we often use the word 'normal,' as normal physical findings, normal blood chemistry, normal body mechanics, and so forth. It is rarely pointed out that what we are labelling and accepting as normal is at best a 'better than average.'

Even though present techniques for establishing normals are useful and well accepted, they are nevertheless vague and arbitrary. It is my feeling that the failure to discriminate between 'average' and 'normal' has been a major stumbling block in the progress of the healing arts.

The confusion, disagreement, and semantic fuzziness that pervades medical literature is reduced in physics, mathematics, and engineering. For

this reason I propose a physical-mathematical formulation of 'normal' for the body of man. 'Normal' in this paper refers to the most economical functioning of the human body.

After describing a body design that is capable of performing most economically, a myofascial manipulative technique has been introduced, which I use to bring patients towards their potential norms and hence toward optimal body functioning.

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HUMAN POSTURE AND THE OSTEOPATHIC LESION

J. T. S. DUNHAM

I would like to approach this subject in a rather general way in order to try to form some sort of picture of modern man, his way of life, and its effects on him. I am taking this approach because the subject is such a large one, and so many factors and influences are involved, that many investigations into the numerous facets thereof might be made without exhausting the subject. So often in looking over my student notes I come across the phrase "Improve the patient's posture" or "Correct postural defects". What do we really mean when we use the word "posture"?

We all form mental images which we at some time or another place beside words and which remain unchanged for years. My mental picture for posture is an interchangeable double one whose final selection depends on the qualifying word 'good' or 'bad'. The first picture is of an athlete standing on the Olympic Victor's Rostrum, while the second is of an ageing, purple faced, overweight, flabby clubman, sitting on the middle of his back in a deep armchair reading the *Financial Times*. Campbell's *Orthopaedic Surgery* defines posture very briefly as "The attitude of the body with regard to the relation of the several members". We as osteopaths are rather inclined to think of posture in a mechanical static sense in relation to a patient standing or sitting. This is all right as far as it goes, but the word 'posture' should, and does mean a good deal more than that. The *Oxford Dictionary* gives the following definition – "carriage, attitude of body, or mind. Condition, state." The first word – *carriage* – rightly places emphasis on a dynamic state of affairs, but when the dictionary says – "*body or mind*" – it separates them, whereas in most cases they are inseparable, and an attitude of body can be reflected in a corresponding attitude of mind and vice versa. One only has to walk the wards of a mental hospital to see the truth of this. In the past, medically, there was a tendency to remove the dog's head from his body and consider each separately. It was convenient – but very misleading.

Good Physical Posture: I would define as the dynamic attitude and poise of the human body in which an absolute minimum of skeletal muscular activity is used or needed in order to maintain the framework of the body in the most efficient balanced state of continued equilibrium whether active or passive.

Good Mental Posture: supposes freedom from acute or chronic fear, good heredity, reasonable upbringing, reasonably harmonious adjustment to environment, an alert, interested, *tolerant*, mind, satisfyingly employed, and a sense of humour.

Physical Postural Defects may be listed as follows:

Congenital: Results of poor heredity, developmental defects, skeletal malformations. disease.

Acquired (functional and organic): Trauma, malnutrition, disease or disturbance of the nervous, skeletal, muscular or glandular systems. Osteopathic lesions and their sequelae. Bad habits of deportment, maldistribution of adipose tissue, adiposity. Disuse, misuse and abuse of the body. Fear, anxiety, worry, chronic tension, chronic anger.

I propose to talk about postural defects from the standpoint of the functionally acquired defects of the average human, ignoring those caused by gross pathological and developmental changes. Most physical postural defects are finally manifest in the spine as either kyphosis lordosis or scoliosis in varying combinations depending on the body's ability to establish and maintain functional balance.

There is a growing belief amongst biologists, supported by recent discoveries of skeletal remains – generally agreed to be human – preserved in a coal seam, whose age is fairly accurately shown by the “carbon molecule clock” that man has been an erect two-legged animal for a few million years longer than had previously been suspected. It is amazing to think how the human spinal column, which we consider from an engineering viewpoint to be a rather poor proposition in the vertical position, has managed to survive and adapt itself to such varied conditions of use and environment so that man could have such a wide variety of activity as he has had from his first appearance to the present time.

One reason for this is that until recently change of environment and activity has been very slow. Nature hates a sudden change – but given plenty of time she can adapt herself to nearly anything. In the dim past, the human habits of any thousand years were very similar to the habits of the preceding thousand. Man probably reached his physical peak as a seminomadic hunter of forest and plain – in the period before he began to turn his hand to farming; as his numbers grew. With farming, even in its primitive beginnings came man's first monotonously repetitive movements that were to tax his physical adaptability from then on. With increasing

civilization man becomes less and less active in general but with more specialized movements adapted to industry, and affecting relatively few muscles at any one time, as in weaving, mining, masonry, carpentry, etc.

CHANGING CONDITIONS

Observations and generalizations made on the subject of posture at the beginning of the century would have held good, in the main, for conditions of human life for the previous fifty years, but not previous to that or for the present day. The reason for this is the occurrence of the two greatest revolutions in human behaviour inside a period of a hundred and fifty years, plus two World Wars. These have caused more changes in conditions and environment than took place for the previous two thousand years.

The first of these – the industrial revolution – was to change completely the long ingrained habits of life of a large part of the world, while the second – which was the revolution of transport and communications – is causing nearly as much upset in man's way of life as did the former, but in a different way.

The final migration from the land is nearly complete and man has become almost completely an urban and suburban animal. A hundred years ago the population of England and Wales was fifteen million people: more than half were engaged in rural or semi-rural pursuits. A quarter of that population lived in towns of less than twenty thousand, with fields at their back doors. The great majority were the sons or grandsons of farmers, yeomen and craftsmen.

When we consider the tons of barbiturates tranquillizers and pep pills consumed; the sea of alcohol in various forms imbibed; the fact that half the hospital beds in the country are occupied by mental patients – and that the suicide rate is rapidly increasing; can we still feel that all is well with the nation. (Yes, I suppose we are surviving – in a sort of way – if you like that kind of thing.) When the politicians talk about doubling our standard of life in the next twenty years, do they mean that the sedative intake will be doubled or perhaps quadrupled, and that ALL the hospital beds will be in use by mental patients – could be!

Nervous stability would seem to be the first and most important casualty of modern civilization. Mental posture is definitely becoming POOR, and may get much poorer as new factors make themselves felt. We have in fact

already taken many blind steps towards the world of Aldous Huxley's *Brave New World*, which seemed quite ridiculous when the book was published, but the predictions of which are more than half fulfilled already. The thought should be a salutary one!

We have already reached the age of NO EXERCISE—or Exercise by Proxy, made nearly complete with a nation of inert televiewers. About four thousand watch for every man who takes part in playing a game. Twenty years ago we used to laugh at the American who used his car to go a hundred yards to buy cigarettes. We don't laugh now – we just do it too! Just look at the contents of any bus, or railway carriage – any two rows of a theatre – Parents Day at school – or any fifty spectators at a football match. What a miserable lot of ill-assorted specimens they are! Compared to a similar number of animals of any other species, how much greater and more comical their variations. Some are barrel-like, some pole-like, some human hairpins, some like exaggerated dollar signs, some pendulous bellied, round shouldered, sway-backed. It's amazing the number of malformations that can be developed by the human animal. It would be quite impossible to put them in a ring and judge them on points as one could a similar number of horses or dogs. This is largely due to the *free will* which the human being has to a much greater degree than the brute. The amount of physical exercise these human animals get is confined to getting up, dressing, eating, a little walking, talking, a few repetitive movements called work, driving the car, and going to bed. They have occasional bursts of exercise like the fortnightly game of golf, which because of the gap in time probably does more harm than good. Soon the only real manual workers will be the boxer and the osteopath, and from some of the mechanical contrivances I see advertised in the *AOA Journal*, the boxer may soon be alone. This has *already* happened in the U.S., I hear – but then they are twenty-five years ahead of us!

These remarks are made about the over thirties for the most part, and become more true as middle age approaches with degenerative changes. We would seem to be following rapidly in the footsteps of the American way of life, and are rather blindly adopting some of its worst features and most of its nervous tensions. The great dangers of civilization are speed, noise, propinquity and a lack of real purpose—except perhaps in time of war. We would seem to be becoming imprisoned in our own activity and more organised for work than real existence. Children must know ten times more than their grandparents at the same age, with often much less

security of home background on which to build. The average citizen must have a wider knowledge of a multiplicity of things to carry out his daily life though being naively helpless about things his grandfather would have known about almost instinctively. We, along with events, are moving a hundred times faster than ever before, on land, sea, and in the air. Continually at the mercy of the telephone, wireless, television, newspapers and a cacophony of canned music. Can you imagine our grandfathers plunged into the Babel of a modern steel works or office, the confusion and noise of rush-hour traffic, and the almost complete lack of privacy? They would probably last only a few hours.

The result of all this rush, apprehension, irritation, frustration, overstimulation and fear is a surplus of adrenalin, free and un-eliminated in the tissues for long periods. This brings into play, in a chronic manner, Cannon's emergency reaction with further heightening of nervous tension. When emergency adrenalin is produced in the wild state it is in a situation in which the animal will either fight or run, the action of so doing removing excess adrenalin from the tissues. Often the human may feel like fighting or running, but, being well brought up, he does neither, with the result that the excess adrenalin is very slowly eliminated, and so acts as a toxin, until it is. No wonder such a subject becomes seriously debilitated and chronically tense from his restless inability to relax mentally or physically. He becomes chronically tired and finally has neither the desire nor the ability to exercise.

As normal muscle tone is lost with the lack of regular exercise the atonic body becomes increasingly dependent posturally on ligaments for anything approaching balance. The body will attempt and usually succeed in adapting itself to the functions demanded of it. But, if less and less is demanded of it, its ability to respond becomes less also. If latent reserves are used less from generation to generation it may not take many generations for them virtually to disappear. We have reached an age of medical enlightenment when not only the fittest survive, but nearly all survive – in a sort of way. Not only can we now keep the C3's and 4's alive, but we can breed them together. The thought would make any self-respecting stockbreeder have a fit. One cannot fail to be impressed by the poor general muscular condition nowadays of so many children of prep school age. Flat feet would seem to be very common. Drooping posture, thin chests, and general shuffling slovenliness would seem to be the rule rather than the exception. Real inability to sit or stand reasonably straight is universal.

I feel we must look at the whole background of modern man to understand what is happening to him. Certainly it would seem as general muscle tone is lost or diminished, development of postural compensations to occupation and environmental conditions becomes more marked. MAN IS BEING PERPETUALLY MOULDED TO HIS ENVIRONMENT. He must be able to find out if that environment suits him, and if it doesn't he must make every effort to change it before it changes him. This is an ideal, and the most we can usually hope for is a change of both to the point of reasonable harmony. Physical and mental posture is always a compromise between a human being and his environment. The formative years offer the only real opportunity to influence posture to any degree. After the age of twenty-three to twenty-five little can be done to rectify marked postural defects unless the formative occupation and background is changed and changed slowly, as harm can be done by striving for structural perfection. Functional defects may be prevented from becoming organic, and by correcting osteopathic lesions in a rational manner we can assist the man to make a good compromise with his environment. Complete symmetry in nature is very rare but overall balance is universal. The growing tree is never symmetrical, but it is balanced and if carefully cut across at the base will remain standing and balanced in still air.

The two most important functional capacities that modern man seems in greatest danger of losing are his innate sense of balance and his inherent unconscious sense of rhythm. Let us first of all consider balance: Modern man with his too freely available transport, his many hours sitting by day, and his lack of free exercise, has tended to "slump on to his ligaments" rather than depend on his skeletal muscles to achieve neutral equilibrium—yet, when instructed how to sit, stand and walk in a balanced but completely relaxed efficient manner, he soon becomes conscious of a sense of well-being and alertness. Natural primitive man, like the animals was a subtle aggregation of many interrelated rhythms which were in turn geared into the larger solar cycles which directly influenced his life. There were the constant ebb and flow of the seasons, the tides, daylight and darkness, hunger and satiety, exercise and rest. There is something inherently satisfying to man in rhythm, ebb and flow, perhaps because it is part of the basic pattern of the universe. All animals are rhythmic in their movements and habits except when their pattern is broken by fear or excitement. Everything has tempo and rhythm, whether it be a cow chewing the cud, a giraffe galloping, a native playing his tom-tom, or the atomic activity in the molecule.

It has been shown recently that in man there is a definite ebb and flow of cerebral function during a working day with its high tides and low tides. A healthy active man walking at what he considers to be his most comfortable economic speed – the speed at which he can cover the greatest distances with the least expenditure of energy – will be found to have definite rhythmic ratio between his pace, his heartbeat and his respiration – the usual ratio is one step per systole, and eight steps to a complete respiration. This ratio may remain the same when he is comfortably running. If he has a bradycardia he may take two steps per systole. This is the reason why the body automatically selects this particular gait as the most comfortable. This is also the speed at which exercise is most beneficial, particularly to the postural muscles which get alternate side to side exercise at the body's own rhythmic rate. If man gives up walking – and I mean real walking, as he certainly looks like doing, he will be giving up one of his last important links with his natural innate source of rhythm and balance. I was most impressed during the war when so many people laid up their cars and took to Shank's mare – so many of my chronic patients dropped out of sight only to return as soon as they had their cars going again.

To give one small example of the way in which modern man can lose instinctive faculties – a friend of mine who is a farmer and also a water diviner, can tell the state of the tide when miles away from the sea. Primitive man probably had all sorts of instincts of this sort which were part of him. Let us look for a moment at a typical sedentary modern man, who is reaching the end of a bad day at the office. His new secretary is a muddler, a couple of important deals fell through before lunch, for which he was late and had to rush, with resulting indigestion. The boss gave him that “wonder why we keep him” look a couple of times in passing. Pneumatic drills have been at it all day in the street outside. His wife phoned to tell him not to be late as her mother was coming for the weekend. He could pull the phone out by the roots with the greatest of pleasure. His rheumatism is bothering him. Nobody loves him. Now – get this man through the rugby scrum to his car, which is two sizes too small for him and has collected a parking ticket since lunchtime. Seat him in the driving seat with its two springs gone and one side of the back broken. Start him off for the fifteen miles home in the rush hour traffic. He has left the driving window down to keep his windows unfogged, it's a cold night. His eyes and brain are bombarded with flashing lights, traffic movement, and impetuous pedestrians; his ears are blasted with various noises. While keeping an eye on that brute in the Bentley behind who keeps pulling out

to pass, when there really isn't room – he nearly hits the car in front. He grips the wheel with apprehensive tightness which doesn't help his neck and shoulder muscles (half frozen on one side), which are already trying to cope with his unbalanced seat and the variety of haphazard up, down, fore and aft, and lateral movements. His right foot is indecisively poised between brake and accelerator. On his arrival he has to turn his head back to front, with his already exhausted spastic neck muscles to get the wretched thing backed into a too small garage which prevents him from more than half opening the driver's door to extricate himself. He has reached the whimpering stage that only a couple of large whiskeys will subdue before he can face his mother-in-law.

Think of the countless osteopathic lesions that are produced daily in the lumbar – the upper thoracic and cervical region in this and like manner. It would seem to me that modern life is placing more strain on the upper spine than it has ever had to stand previously. We see this all the time in practice, and can only conclude that therein lies one of the very big contributory factors in the production of the modern scourge tension and irritability, by virtue of the effect of these lesions on the blood supply to the brain itself.

I have perhaps had a rather better opportunity than most osteopaths in contrasting the old with the new, as my practice is based on a solid agricultural background, and at least half of my patients come from this source. It has been my privilege for the past quarter of a century to have as patients farmers, and others closely associated with the land and animals. I say privileged because by the very nature of their life, they are for the most part patient, philosophical and understandingly co-operative in anything done to help them. It is most interesting to me to compare posturally and physically the older generation of farmers, now over fifty, with the next generation. These older men were expected to do a man's work from a very early age, under arduous conditions, and more often than not on an inadequate diet, low in protein and vegetables. This work, before agricultural mechanisation and weather protection, was often long, hard, grinding – near slavery.

Scant notice was paid to weather and a man's clothes might be wet through and partially dried on him several times a day. They were frequently subjected to strain and trauma from hard work, heavy lifting and fractious animals. These men and women frequently had bouts of so-called rheumatism as they got older. They developed scar tissue readily, to be

followed later by marked degenerative spinal changes usually of a hypertrophic type. Their spinal movements become more and more limited, kyphosis and scoliosis preceding ankylosis took place – yet, these men were still capable of doing a hard day's work, although at a slower pace. They were phlegmatic, long suffering, thanks to a fairly high threshold to pain. A not surprisingly high proportion of the males particularly, developed arthritis in one or both hips. Talking of threshold of pain, I know of one man who treated one of his own molars which was abscessed, by splitting it with a nail and a hammer before removing it piecemeal.

The younger generation of farmers in their emancipation present a very different picture both mentally and physically. They are better nourished and not so stunted as their fathers, not having had to work so hard so young. They are much more nervously tense less phlegmatic, and much less patient, as they more closely approach the suburban way of life. Their life is less arduous, but more complicated, as science and inspectors invade farming. They are developing commercial travellers' upper back and neck as they drive cars and trucks more, while the other most frequently seen osteopathic disability seems to be sacro-iliac and sacro-lumbar strains; true disc lesions and herniations often traceable to driving a tractor with their trunk rotated to control some implement that was being towed. This type of strain has become much more frequent with the advent of pneumatic tyres on tractors, which give just the right amplitude of bounce, to strain these segments in no uncertain manner, with the body in a semi-rotated state, supported by already fatigued muscles. In no section has the change to modern ways of life been more dramatic, with the possible exception of that of sailors from the square-rigged vessels to the steamboat. Yet this older generation were contented men, and seemed to live to a great age. They suffered much weariness, but were strangers to tension, which cannot be said of their sons.

THE UNTREATED LESION

As an osteopathic student I used to worry about the millions of people in the world with osteopathic lesions of various sorts, who had no possible hope of ever having them corrected. How did they survive and what became of them and their associated visceral dysfunctions? Nature must, in fact, have done as satisfactory a job of spontaneous healing, to skeletal structure as to other parts of the body when injured, or the race would have

been on all fours by this time. Let us consider how this mechanism worked with the average healthy human. In past generations of more active life a very large percentage of simple osteopathic spinal lesions must have corrected themselves spontaneously – although this may not be so true today. After the initial stage of pain and acute muscle spasm had subsided with rest, the involved joint was most probably completely remobilized either at once, or by a gradual process, as the body resumed its normal activity. A small proportion of these initial lesions would not so respond, but due to pronounced strain or prolonged irritation and inflammation would become chronically restricted in movement due to secondary fibrotic changes – and become a symptom free abnormality.

Anything which directly or indirectly disrupts the mechanical integrity of the vertebral column must be compensated, and the lower down the column this occurs the more necessary the compensation. The compensation to an original lesion may be so slight as to be virtually undetectable, and may amount to nothing more than an instinctive avoidance of a particular part of a movement of which the normal joint formed a component part. Such lesioning may be repeated many times at many levels with the body doing its best to make a functional compromise to keep the individual, as a whole, upright and going. Each time this sort of thing happens the general reserve of compensation is dipped into and becomes less and less. In a chronic state of affairs Wolff's' Law holds good, that is – “Every change in the formation and function of the bones, or of their function alone, is followed by certain definite changes in their internal architecture and equally definite secondary alterations of their external conformation in accordance with mathematical laws”. Plasticity of bone, particularly in children implies structural changes in the vertebrae and adjacent structures. Hence functional postural defects and functional scoliosis in young people while the bones remain relatively plastic, can result in organic malformations as the bones become harder. Our only chance of doing much for these postural abnormalities is during the period of growth.

A state of affairs can develop where two or three systems of compensation at different levels attempt to form a single overall system; this usually causes chronic irritation at the point of meeting or where curves cross the mid-line. These are the points when one expects to find facilitated segments that cause so much visceral disturbance. This is the stage of protest when the body by pain, disability or visceral disturbance calls for help.

If the patient disregards this protest and carries on, if he can, the body then begins a rearguard action which consists of further fibrous immobilization, gradual absorption of the overtaxed discs and final splinting with exostosis. This is the classical picture and varies with the type of individual, his age, occupation, his ability to form scar tissue, and his temperament. A moderate imbalance due to uncomplicated osteopathic lesions or even congenital abnormalities, such as an anatomically short leg, in the young active adult, may be quite compatible with symptom free health.

It is usually only when the rugby player or athletic person begins to give up his game and becomes more sedentary that symptoms become troublesome. But this is not always so, and we all know cases of quite marked imbalance that never seem to cause the individual any apparent inconvenience or symptoms. So often cases of so-called 'rheumatism' in middle age may be nature's attempt to compensate for old imbalances by laying down a lower grade of supportive tissue. The more active the individual the more important his skeletal muscular system becomes in maintaining postural equilibrium, while the less active he is the more dependent he becomes on his ligamentous tissues. All repetitive physical movements will leave their postural mark. All coincidental osteopathic lesions may modify that postural mark. Any long established postural trend can be modified by a complete change of occupation, but the longer the original activity has been maintained the less chance there is of changing it – and the more marked the upset will be from so doing.

This last statement should be kept in mind with the patient who first comes to us in middle life having had various traumas, with compensations of a postural nature, but who has remained active and relatively healthy. Eventually as he becomes more sedentary or changes his way of life, he has a final trauma that upsets his compensation – the veritable straw that breaks the camel's back. It is a matter of some judgment to know just how much one should try to do, in the best interests of the patient. Should one be content to relieve his immediate symptoms or should one attempt to reverse and normalise the compensations of years? I can remember many patients who were relieved of their symptoms in two or three visits, and who I then attempted to make structurally normal, as well as symptom free. In retrospect I feel I should have erred more on the side of conservatism. Many of these patients had to endure a long retracting of symptoms, somatically and viscerally. Perhaps we should be less perfectionist and more content with just helping nature's compensations.

But with the younger active adult I would have little hesitation in trying to normalise his spine as a whole. While we can normalise individual segments it is doubtful if we can much influence an acquired posture after the age of twenty-five, except by a complete change of occupation. Often a change of occupation can cause a marked degree of pain and disturbance for a varying period, as the spine readjusts itself to the new conditions. Even having a holiday may cause pain in a person with an occupational compensation who never has any inconvenience while doing his usual job. For many years I have been impressed by the number of athletic well set-top, soldierly types who suffer marked symptoms and disturbance from what would seem to be comparatively insignificant osteopathic abnormalities. Conversely, one is even more impressed by the countless gross distortions of the spine ranging from old Pott's disease, vertebral fractures with deformity to spondylitic deformities and organic scoliosis from which the patient has few symptoms and surprisingly little loss of function.

In the first group much would seem to depend on the type and temperament of the person involved. These people seem almost "allergic" to osteopathic lesions – but not often so in a neurotic sense. They are usually the tall, often well muscled, sensitive people, frequently with some vasomotor instability and a rather 'hair-trigger' nervous system generally. They seem to develop more quickly the visceral component of a given lesion and more readily develop a facilitated segment. They are rather prone to have the familiar "chain reaction" of ascending or descending spinal symptoms – or both, depending on the initial starting point and the amount of compensation their spine has already acquired. These are the people who are inclined to retrace their previous symptoms when treated in an adequate osteopathic manner. They do not seem to form scar tissue or develop degenerative changes so readily, and their spines are often hypermobile. They do, however, become much more stable as they reach middle life. Such people are usually ill fitted both physically and mentally for heavy muscular work and gravitate to the sedentary, executive, clerical, scholarly and artistic occupations.

SOME PRACTICAL CONSIDERATIONS

A great deal more attention will have to be given to improving the conditions and training imposed on children during their formative years, so that they may grow up having acquired good postural balance, poise, and

as good a physique as possible from the available raw material. This will become increasingly difficult as more and more C3 humans reproduce those that, thanks to modern antibiotics, etc., have survived to a breeding age, and who previously would have succumbed in a world in which survival of the fittest was the rule. A time may come when a more important part of a child's upbringing will include extensive routine training, on how to sit, stand, walk and run with complete rhythm, poise and balance, using only the minimum muscular outlay for each.

Perhaps the most important training for all citizens of the coming age will be that of instructing them in the necessary technique to enable them to completely relax both physically and mentally at will. This ability is the most striking attribute of primitive man and animals, that modern man is in danger of losing – or has already lost. Never was the realisation of this fact more needed than it is in these tense, nerve-racking times in which we live. Never was it more necessary to stress the surprising ease with which we may find the peace that passes all human understanding – by stilling the body and the mind and looking within. If a daily fifteen minute period of complete physical relaxation and mental stillness were made compulsory from infancy to school leaving age, the benefit to the nation, to say nothing of the individual, would be enormous. The relaxing technique of the late Eeman, or simple Yoga relaxing methods, with its emphasis on breathing, would suffice. A start has already been made in a great many schools with the Jacques-Dalcroze method of Eurhythmics, and the BBC broadcasts of similar methods, followed by a short period of relaxation listening to quiet suitable music. Unfortunately, this training comes to an abrupt end at the age of twelve.

Children and adults alike will have to learn the habit of stretching themselves instinctively after any period of inactivity – much as an animal does, and as frequently. As a race we are far too wooden, and rock 'n roll can do nothing but good in helping to shake the younger generation out of this attitude. There is a wide open field for the scientific design of school furniture to suit the varying sizes of growing children. This is at present in the hands of a small number of firms whose designs are drawn with the idea of catching the eye of the architect rather than that of the osteopath. For children the long periods of sitting will have to be broken up and interspersed with intervals of physical activity. Games directed more towards producing poise, mobility and alertness rather than brute force and muscle, should be encouraged. Rugby football is probably the greatest

organised body mangler during the formative years known to man, and a frequent cause of various troubles later in life.

Children's footwear must be better designed, and expertly fitted. Parents must be made to realise that the longitudinal arch of the human foot does not normally appear until the fourth year, and that manufacturers who capitalise on this fact, whether cold bloodedly or in ignorance, by selling shoes for infants with arch supports in them, should be denounced. All growing children should be examined osteopathically at least twice a year. As modern man spends so much of his time sitting, his posture is being continually moulded by the seats he sits on or in. Whether at home, in public transport, the car, the office, the theatre or the church hall. While the seat in public transport and the theatre must be designed for the average man who may exist, but who is seldom seen – they are at best a compromise and usually badly designed. There is, however, no reason or excuse why the seat we habitually use at home should not more nearly coincide with our respective physical requirements.

It should not be beyond the ingenuity of the motor manufacturer to offer a choice of at least three alternative designs of seat for each model, for which the driver could be fitted. Each driver's seat should be capable of adjustment for position, height, rake and also for varying the angle between the seat and the back. The bucket type of seat when properly designed is more satisfactory for most, not only does it afford better lateral support, but obviates holding on to the wheel for support, and increases the area of contact with the body allowing for greater relaxation. The bench type of seat is usually found to be more comfortable for the person who has a scoliosis; for the reasonably normal person the bench type of seat can be greatly improved by the use of a 'Sit-Rite' back rest. In the home, the Parker Knoll wing chair would seem to be a very good compromise for the great majority of people. Most so-called 'easy' chairs are too long in the seat and too low.

Seeing we spend a third of our lives in bed, it is of vital importance that beds be well designed. The modern tendency is to make them much too soft and sagging. In my experience a moderately firm five-to-six inch deep interior sprung mattress on a solid base is comfortable, restful and adequate. Latex with a top layer of insulation would seem ideal theoretically, but few people seem really to like it. One pillow or at the most two small ones is right for the vast majority of people. In this regard it is interesting to look back at the Victorian age with its huge bolsters, three

or four pillows and a feather mattress. One is forced to the conclusion that our grandfathers slept sitting upright! Perhaps they were so grossly charged with food and port that they could only lie flat at the risk of smothering or drowning.

During the last quarter of a century a lot of thought has been put into the design of the tools, equipment and working conditions of the housewife, until at present a point of nearly uniform standardisation has been reached. Unfortunately, no way has yet been found to standardise housewives to fit the equipment. The height of the various working surfaces is of the utmost importance to the woman who has to spend several hours a day using them. There is nothing more chronically disturbing to the lumbar and pelvic geometry and its musculature than working slightly bent over a sink that is three or four inches too low. A housewife should be measured for her kitchen furniture, and this is quite easily done by finding the distance from the point of her dependent flexed elbow to the floor, and subtracting three-and-a-half inches from it. This should be the height of her sink and working surfaces. Now the difference in this dimension between the five-foot tall and the six-foot tall person is not so much as one would expect. It is seldom more than four inches in the majority of cases – but what a difference these four inches make! Manufacturers should be persuaded either to produce three different heights of sink, etc. or have adjustable legs or interchangeable bases for their existing units.

The two remaining posture moulding institutions are the FACTORY and the OFFICE, which roughly divide the remainder of the population. In the modern factory automation, will, to a large extent relieve the majority of workers of the more soul destroying monotonously repetitive work and allow the operator more freedom to move about and vary his position, while shorter hours will lead to an improvement in his mental and physical posture, when he has learned how to spend his new leisure. It is gradually dawning on industrial management that the relaxed comfortable worker is a more efficient and safer man, and management are attempting to snake the factory cleaner, quieter, and more congenial in every way. In the past these people were too tired to do much more than watch a few men play football; or play darts in the local. It will be difficult for these workers to re-orientate themselves to their new conditions and shorter hours, and they will most likely go through a difficult transition stage. The average white-collar worker trapped in an office does not fare so well. Apart from the rush hour commuting madness, his job is completely sedentary and often completely

boring. There should be an hourly break of at least five minutes when office staff could move about and stretch themselves. Office furniture could be much better designed and an alternative work position encouraged. There is a lot to be said for the old fashioned standing desk to which could be brought a high stool with an adjustable back rest like a stenographer's seat. The relative position of the typewriter to the typist should be capable of variation in order to avoid strain imposed on the upper thoracic, cervical spine and shoulder girdle which is so common, due to working in exactly the same position for long periods of time. In the same way the frequent use of the hydraulic lift on the McManus table and the dentist's chair will allow the osteopath and the dentist to last much longer.

IN CONCLUSION

We might almost call this the age of tiredness. Poor physical and mental posture seem to be on the increase. There seems to be a connection between this increase and the degree of civilisation man enjoys. The basis of this connection is a degenerative one. Spinal trouble amongst present day native Indonesians is practically unknown. A recent medical survey shows that sixty-five per cent of the population of Sweden has low back pain. The incidence of back troubles is four times as great amongst white Americans as coloured Americans. McRae suggests after thorough post mortem investigation that "nearly everybody forty years of age and over has at least one cervical and one lumbar disc protrusion" – which, however, need not necessarily be associated with symptoms. Modern civilisation is slowly undermining man's ability to adapt himself to his environment. There is a great increase in the degenerative diseases as man lives to a great age. There is an increase in spinal ailments and degeneration, proportionate to the degree of civilisation and not just to the fact of living longer. There is a connection between the unstable spine and the unstable nervous system, but more so between the arthrosis of disuse than the degenerative hyperplasia of over use.

Extrinsic factors disturbing both the postural integrity of the spine and the nervous system are abundantly present in modern life. We are faced with a geriatric problem of unforeseen magnitude, of which senile dementia becomes an ever-increasing part. The more sedentary and degenerative man becomes, and the more his natural reserves are diminished, the slower and less complete is his response to treatment – the rural patient responds

to treatment much more promptly than does his urban brother. We are rapidly reaching a time of material satiety, which when fulfilled leaves man with little real purpose in life. If man could be persuaded to do the following, a lot of his postural troubles, both physical and mental, would be helped:

1. To find his legs again and use them to walk at least two miles a day.
2. To spend at least fifteen minutes a day in quiet seclusion practising deep relaxation and learning at the same time to still his thoughts.
3. To carry this relaxed attitude of body and mind into all his activities.
4. To tense for a few seconds all his skeletal muscles and then stretch like an animal, several times a day.
5. With osteopathic help, attempt to reach the best possible compromise with his environment.
6. To find if possible a real purpose in life, so that he may become serene and happy.

THE OSTEOPATHIC LESION

CARL P. MCCONNELL

This paper was prepared under the auspices of the Research Institute, and, by consent of the Council, was in part presented before the New York Society, March 1910, and in part before the American Osteopathic Association, San Francisco, August 1910.

The object of this contribution is to outline what experimental data the writer has to offer in support of the validity of the osteopathic lesion. It is not a monograph or treatise on the many phases of this subject. Much collateral material, clinical and physiological, has been presented to the profession, and more could be offered by many of its writers. For the past six years we have carried on a number of experiments comprising work on forty dogs and six guinea pigs. These experiments were in strict accordance with the commonly accepted definition of the osteopathic lesion: "any structural perversion which by pressure produces or maintains functional disorder" (Hulett). In addition to this, we have accepted as basic physiological truths Dr. Still's dicta: "the rule of the artery is supreme, and the living body contains all the attributes of a vital and physical mechanism." The purpose of the experiments was to determine, if possible, what actually occurs when structural relations are disturbed, and so maintained, by mechanical or traumatic means.

PRODUCTION OF THE LESION

The production of the lesion is a simple but still a very important matter. It cannot be performed successfully in a haphazard manner. Strict attention to the thorough relaxation of tissues about the field of operation and definite application of mechanical principles are demanded. After selecting a healthy animal (a small or medium-size dog is best), surgical anaesthesia is necessary. Following this further relaxation of the area of intended operation by traction is essential for ease of lesion production. Next, having determined the character of osteopathic lesion desired – that is, right or left rotation, or hyper-extension, or hyper-flexion, or a combination of these – the second essential is to apply definite mechanical principles. Bringing the fulcrum to bear at just the desired point when the tissues are thoroughly relaxed is as necessary in producing a lesion as in adjusting one. Much strength can be wasted if the leverage is not right; otherwise comparatively few pounds' exertion will accomplish the result.

A simple way is to place the animal flat upon the belly, completely under surgical anaesthesia: then, while an assistant bears down with his thumbs upon the selected vertebra, the operator grasps the animal by the rear legs and exerts traction in line with the spinal column until the spinal muscles thoroughly relax and stretch: then immediately, while still maintaining the traction, hyperextend and rotate the spine until the desired point is felt to give and slip. Or, while still maintaining the traction have an assistant suddenly exert pressure, a thrust, upon the desired vertebra. It is simply a question of applying the indicated mechanics. Various leverages may be utilized. Frequently we place a small block transversely under the animal, especially in producing rib lesions, in order to help separate the ribs as well as to secure a stable fulcrum.

The traumatism is not carried to a point whence tissues are torn or lacerated. The object is to obtain a slight slipping or maladjustment of the articular surfaces. If done correctly—that is, specifically—little force is required. The immediate noticeable results are malalignment of the vertebrae, malposition of the ribs corresponding to the damaged vertebrae if the lesion is a dorsal one, and contraction of the spinal muscles of the same segments. These changes are readily palpated. After recovery from anaesthesia and during the ensuing time the above characteristics are evident, with the added ones of tenderness and rigidity. Muscular contraction usually subsides, but not always, until only the deep spinal muscles adjoining the lesion are palpably contracted. In some cases it is noted that upon movement the back is stiff and tender. In others such is not the case, and shortly show no apparent ill effects. Later on a number present more or less systemic disturbances, depending upon the locality of the lesion. The periods of observation have ranged from three to eighty days – that is, the time from production of the lesion to autopsy.

DISSECTION OF THE LESION

Before the lesion is dissected a thorough autopsy is made in each instance and specimens secured of various organs and tissues, whether or not they show any pathological changes, or correspond nervously with the osteopathic lesion. The special reason for the microscopic study of so much material will be stated later.

The dissection of the lesion and the securing and fixing of the specimens is executed with much care. After a thorough examination of all the viscera and tissues, with the exception of the brain, has been recorded, resection of

six or eight vertebrae, including the ribs and contiguous muscles, ligaments and nerves, intact and *in situ*, is made; that is, the spinal column segments two to four vertebrae above and below the lesion are removed in order to facilitate careful and expeditious dissection and examination. At this point, and up to the severance of the damaged constraining ligaments, malformation and rigidity of the lesion is readily noted. Even the contracted muscles and parts of muscles do not relax. It is the deep contiguous muscles of the multifidus spinae that are most involved. The spinal muscles are carefully separated and removed, as well as the nerve fibres supplying the same. Next, the sympathetic chains and their connecting fibres and rami are removed with as little traumatism as possible. Frequently small haemorrhagic points are detected in the sympathetic tissues corresponding to the lesion.

Following this the ribs are removed and the intercostal nerve, artery and vein retained. In a few instances bundles of intercostal muscle fibres are found contractured, and also slight haemorrhages of the surrounding intercostal tissues are detected. After the spinal muscles, ribs, sympathetics and intercostal structures have been dissected and removed the rigidity of the remaining vertebrae does not seem to be specially impaired. The next step, separation and removal one by one of the six or eight vertebrae, requires particular pains. Severance of the articular ligaments and dissection of the tissues intact passing through the intervertebral foramen require considerable skill in order not to produce artefacts. Also, great care has to be taken in separating the spinal-cord membranes from its suspensory ligaments and tissues.

In the lesion itself we fail to see where there is any perceptible partial occlusion of the spinal foramen by the encroaching bony tissues in the great majority of cases. Slight tension of the incased fibrous tissue anchoring the structures passing through the opening may readily occur. This in itself, in one sense, will act as an occluding factor. But careful microscopic examination does not reveal any greater damage to nerves or vessels here than at several other places, and the theory of any pressure or inhibitory lesion *per se* at this particular area is untenable. Strain of the spinal-column muscles alone, especially an unbalanced tension, will unquestionably produce a temporary lesion, but not often a permanent one. After a number of days rest the muscles will, to a great extent, return to the normal, unless there is a very active disturbing factor, such, for example, as considerable inflammation. Even in those cases where there is marked

contracture, complete removal of the muscles produces very little, and at times no perceptible, palpable change in the vertebral rigidity.

This does not apply, however, to ribs, for removal of the intercostal muscles allows comparative freedom of the range of rib movement, owing to the relatively small articulating surface. Consequently, it is found that the permanent vertebral lesion is maintained by overstretched and damaged articular ligaments. Sever either the capsules of the articular processes or the ligaments of the vertebral bodies and considerable motion is immediately obtained. The ligaments of the articular processes are the ones most damaged. The inter-vertebral cartilage itself is usually only slightly damaged. The cartilages of the articular surfaces are commonly little involved. This last statement, however, applies to slight and moderate lesions. Naturally, in more severe injuries ankylosis occurs, which happened in two of the animals. These observations apply particularly to the dorsal and lumbar sections. The cervical region is different structurally: here, for one feature, larger and stronger muscles is an important consideration. Uneven traction of cervical muscles followed by contracture can easily produce and maintain an osseous lesion. Finally, one other point in the lesion dissection is frequently noted, i.e. haemorrhagic points within the tissue surrounding the dorsal and ventral root bundles and within the membranes of the cord (notably between the pia mater and arachnoid).

THE MICROSCOPIC EXAMINATION

First, a word or two relative to the preservation of tissues. This is a most important part of the work. Too much care cannot be given to the dissection. The tissues should be both gently and expeditiously handled. The least possible traumatism is demanded. Animal experimentation in our opinion, is far preferable in the study of the osteopathic lesion to the dissection of the human cadaver. In the former we have the unequalled opportunity of examining absolutely fresh and unchanged post-mortem material. And in the dog the anatomical and physiological variations from the human are practically nil so far as important critical and dependable observations and study are concerned.

The various well-known fixing fluids are used, such as alcohol, formalin, Muller's, Orth's, Flemming's, etc, selected according to the various tissues retained and the several staining methods to be attempted. As a special precaution portions of the same specimen are fixed in more than one fluid and stained by more than one method. For an additional "control," in

order to reduce errors to a minimum, various normal specimens are passed through the same fluids and stains. As to the “control” features and the several technique methods more will be said later.

Naturally, the greatest interest centres in the microscopical findings of the nerves and blood vessels. The Marchi, Weigert-Pal, Williamson and Nissl methods show, without question, that the nervous structures of the spinal cord, the spinal nerve roots and their branches, and the sympathetics corresponding to the lesion, are pathologically involved; while nervous tissues of normal animals, fixed, stained and mounted in the same material and at the same time, show no change. Various cell groups in the grey matter are disturbed; some are more or less swollen, others partly atrophied, and a number normal (Williamson and Nissl’s methods). Corresponding axone degeneration (beginning parenchymatous, Marchi, Donaggio and Weigert-Pal methods) is readily noted, and extending above and below the lesion. Our studies of the cord have embraced only two or three segments above and below the lesion. These changes can readily be classed as primary degeneration which means that the nerve cells are nutritionally disturbed. They are not, as a rule, very extensive or severe, but can readily be traced from the nerve centres in the cord and posterior root ganglion and sympathetics. In many instances they do not include the entire bundle of axones, but one-third, one-half, or two-thirds: in some an entire cable is degenerated. The posterior nerve roots are most affected, frequently all the fibres. The anterior roots are usually less involved, commonly bundles of fibres only, not the entire section.

In cases where the lesion is more severe or the back is stiff for more than two vertebrae, the neighbouring spinal nerves are found more or less degenerated. We have not been able always to clearly trace the degenerated paths in the cord (one reason being that the paths in the dog are not so clearly defined as in the human). But, two paths of degeneration are readily noted, viz: fibres in the posterior column and bundles of fibres from the anterior horn. The degenerated fibres in the sympathetics appear to be largely those of the vaso-motors (fine medullated groups, Marchi method), but this is a difficult point to decide positively. These early changes are, as a rule, a simple beginning primary parenchymatous involvement, and no doubt are amenable, in the majority of cases, to recovery when the disturbed nutrition is rectified. (See cuts).

The changes found in the blood vessels are a highly interesting and elucidating study. The coats of arterioles, capillaries, veins, and in some

instances of arteries, are found deranged from the endothelial cells through the muscle fibres and the outer layer into the surrounding tissue. And in the walls through and into the surrounding tissues are found, in variable quantities, blood corpuscles enmeshed. From an escape of blood plasma to leucocytal invasion, diapedesis and haemorrhagic foci, the pathologic picture is evident. The change is not an intensely destructive one, or one beyond a stage of repair. The entire transverse wall is not, as a rule, involved, only a portion. In a number of the smaller arteries there is a well-defined endarteritis. The involvement is a hyperaemic one, in all probability dependent upon vessel relaxation and atony, followed by plasma leakage between endothelial cells, and escape of corpuscles. This distortion in localized areas of the vessel's wall structure is undoubtedly pathologic, due to the varying diapedetic activity. It is specially interesting to note that the greatest diapedesis, so far as nervous tissue destruction is concerned, occurs about and through the ganglionic regions of the spinal cord. posterior root ganglion, and sympathetics. This vessel disturbance always largely corresponds to the osteopathic lesion so far as the involved spinal foramen (both sides) and the injured ligaments and muscles are concerned. In many of the dissections the nerves, vessels, and connective tissue of the spinal foramen are removed intact, likewise the sympathetics and the tissues of the back, so that thorough and comprehensive pictures of the lesion are thereby secured. The rich nerve and vessel supply to and through the fascia is an interesting study in itself. All of the pathologic changes do not correspond absolutely to the osteopathic lesion, but the changes above and below are much less marked, and undoubtedly are due either to extension of the traumatic lesion or to related nerve paths. In those cases where the mechanical injury is not entirely confined to a single articulation, pathologic involvement elsewhere is noted corresponding to the location and degree of initial damage. Then, of course, as stated, there is the ramification of fibres above and below the segment that should be remembered. The disturbances to the vessels of the sympathetic seem to be just as well marked, but it is to be noted they are less severe in the adjacent segments above and below. The extension of this vaso-motor affection to nervously-related viscera - for example, the stomach and kidneys - is frequently detected: but visceral lesions will be discussed presently.

The hyperaemia in the spinal cord is pronounced, especially in the grey matter. Throughout the posterior horns and the tips and medial sides of the anterior horns are the areas most disturbed, but not by any means exclusively. The circulatory changes vary in different cell groups. This

ischemia is greatest in the corresponding segment and gradually lessens to a segment, sometimes two, above and below the lesion. Congestion, with more or less diapedesis of the anterior and posterior spinal cord vessels, is readily noted. In the majority of cases the posterior vessels apparently suffer the more, the same as the posterior nerve fibres. The additional strain to the anchorage and connective tissues in the spinal foramen may partly account for this: it may be due partly to the peculiarities of vessel distribution and termination, and to the fact that the spinal veins have no valves.

Anticipating, for a moment, a portion of the theoretical conclusion, for the sake of emphasis, it would appear that the damage, inceptively and primarily, would be due to the blockage of the afferent sensory impulses of the joint structure and encompassing tissues, followed by reflex segmental disturbance to the efferent vaso-motor, motor, and other fibres. In this connection it would be interesting to know the relative severity of nerve cell and fibre change due to a disordered viscus, affecting reflexly the viscerosensory and visceromotor reflexes. Hyperaesthesia and muscular contraction of the spinal tissues arising from viscus disturbance is a frequent observation, and we profit clinically by these symptoms. Severance of the afferent fibres from viscus to cord and a histological study of its effects would probably instruct us considerably.

These changes, as stated, are detected in varying degree in nearly all the arterioles, capillaries, and veins. But in the tissues above and below the lesion there is marked diminution in both degree and number of vessels involved. Various well-known methods are employed such as Orth's fluid, formalin, alcohol, etc, with haematoxylin and eosin or Congo red, and the Marchi methods with, at times, an additional lithium carmine stain. At the same time, invariably, normal tissues are run through the same fluids as a check. These lesions are acute pathologic disturbances, and not chronic ante-mortem disorders due to other causes, or post-mortem changes or artifacts.

The microscopic muscular changes are clear and well defined. The contracture is due to an interstitial myositis, wherein is easily seen increase of connective tissue and atrophy of the muscle fibres. It should be remembered that more or less initial muscular contraction subsides after two or three days, and that contractures do not, as a rule, embrace all of the muscle fibres, but certain groups. The deepest layers, these when contracted giving the sensation of a whip-cord on palpation, are mostly

involved. Sometimes only one side is affected. The nerve to these fibres is found degenerated, as well as the related arterioles and veins. The nerve degeneration is due to the nutritionally disordered cells of the anterior horn. We do not believe the muscle disorder is due to direct traumatism, for certain it is that many of them are not factors in maintaining the lesion. This statement should not be misinterpreted clinically, for unquestionably muscular contractions and general muscular tone is a factor to be reckoned with in both producing and adjusting a lesion.

It is the ligaments that maintain a lesion of the chronic type. The injury here is considerable: not necessarily in the sense of lacerations and general exudative sequelae, but the ligaments are strained and stretched, and more or less hyperplasia follows. Proliferative changes and thickening are observed. Arthritis involving the cartilages of the articular processes is not the rule. In most instances the cartilages of the articular processes are normal, as well as the inter-vertebral disc. But the ligaments inclosing the former suffer more than those of the latter. The osseous tissue is histologically normal.

Here a word of caution may be justified. In this study of the lesion an attempt has been made to determine just what the lesion is that is, the initial pathologic changes, not its many possibilities and variations. There must be definite general underlying principles. Our aim has been to seek these, rather than to cover the field of pathology, with its many varying phases.*

THE VISCUS EFFECT

The effect of osteopathic lesions upon viscera is more readily studied, owing to the easier technique of dissection and staining. In addition to the histologic methods, at least two important organs, the stomach and kidneys, can be clinically studied by means of chemical and microscopical analysis. In this sketch it does not seem necessary to go into innumerable details. We are of the opinion that an outline statement of the facts, with a

*To attempt fine discriminations in the pathologic histology would be hazardous, especially with a comparatively few observations on dogs, and wherein the cell groups and nerve paths in the spinal cord are not so clear-cut as in the maze of the not thoroughly understood human. The separation of the several groups of cells in both the ventral and dorsal horns varying in function, staining qualities and blood supply; the five different periods of myelination of the dorsal roots and dorsal columns alone, showing differences of function, are two striking examples of the present futility of such an undertaking. We can concern ourselves only with general pathologic processes. When we have amassed the material of several workers, then finer results may be presented.

presentation of a few photomicrographs, will prove of considerable interest to the osteopath. The temptation to theorize is within all of us. But we are satisfied, for the present, to offer what data we may gather from the experiments.

The lesion effects upon a viscus correspond definitely to the path of spinal innervation. It would seem that, fundamentally, impairment of the vaso-motors plays the important role, although undoubtedly disturbance of visceromotor, secretory and other nerves are necessary factors, and herein, probably, vessel relaxation would take place as a reparative process. Congestion and inflammation are basic to the large majority of diseases, and in all of our experiments we find vessel disturbance a constant feature, whether in the immediate locality of the osteopathic lesion or as a remote effect, but still related physiologically by way of the nerve centres. Consequently, we conclude that some involvement of the vaso-motor mechanism is fundamental to at least a large proportion of visceral lesions. Remember we are considering only the osteopathic experimental field as it is presented to us, and not attempting to correlate it with other undoubted etiologic factors. The effect upon stomach and intestines is marked. First, clinical analysis shows that secretory, motor and digestive powers are altered and lessened: that is, of course, if the osteopathic lesion is a fairly deep-seated one, affecting the stomach innervation. Then the histologic examination reveals one or more characteristic pathologic changes. In the lesser changes, as in all, we note vessel congestion in the submucous coat. Usually accompanying this is diapedesis. In the more marked cases the cells of the mucous coat are nutritionally involved; there are areas of feeble staining and parenchymatous changes, with accompanying pathologic disorder. This is found in areas of both the stomach and intestines. These changes, like all the visceral ones found, are definite acute ante-mortem lesions. At most, the period of time from death of the animal to the tissue being placed in the fixing fluid is only a few minutes.

The kidney changes are very interesting. These have taken place when the lesion was produced in the section comprising the eleventh, twelfth, and thirteenth dorsals only. It would seem without question that the vaso-motors are principally at fault – that is, the initial nervous lesion affecting the kidney is by way of these fibres. The disturbance is a vascular one, resulting in congestion and a typical haemorrhagic infiltration. The nephritis, of course, is acute, and the urinary findings are characteristic of such. The urinary changes are commonly manifested the third day, sometimes the fourth and fifth. In two cases correction of the lesion was

attempted, and in ten and fifteen days respectively the urine was negative and remained so. An interesting point to note is, that the vascular disorder seems to occur first in the glomerulus, and between the glomerulus and capsule; then throughout the tubules. There is probably an anatomical reason for this, due to the vessel's distribution and ending in the tuft.

In our experiments the most frequent lesions have occurred in stomach, intestines and kidneys, for we have experimented principally with lesions to these organs. The visceral changes occur only when the vertebral perversion corresponds to the respective viscus innervation. The nervous distribution in the dog is nearly the same as the human. Those organs having the greatest and most sensitive nerve supply are naturally the quickest and easiest affected.

The liver and spleen in a number of instances were found congested. The liver, especially in areas in the middle lobe, was involved, and the cellular tissue nutritionally affected. This was shown by feeble staining and peri-vascular infiltration. In two cases the pancreas was found acutely disordered. There was considerable congestion throughout several of the islands of Langerhans, and further study and experiments may reveal that this precedes the atrophic changes noted by Opie. The urine analysis after the fourth day showed a moderate amount of sugar. Unfortunately, we were unable to get satisfactory photomicrographs. The adrenals in one case of lesion of the lower dorsal showed a small amount of congestion. A parenchymatous goitre was definitely produced in two of the animals. One of these had a lesion between the second and third cervicals; the other case between first and second dorsals. In both of them several of the near-by lymphatics were enlarged. Occasionally the lymphatics, especially near the liver and intestines, when these organs were disturbed, showed enlargement. All of the visceral lesions were of an acute character and correspond definitely with the vertebral or rib lesions. The reader is referred to the cuts for more detail information.

THE CONTROL

We are aware that in most experimental work an important part is the so-called control. From the very nature of this work control animals would be useless. The work parallels surgical experimentation so far as many of the principles are concerned. Care has been taken in the selection of suitable material. Normal animals have been dissected and the tissues microscopically examined. Almost invariably specimens of the several

viscera not physiologically connected with the lesion have been preserved; normal nervous and vascular tissues above and below the lesion, even from distant parts, as a leg, have been retained; and all were fixed, stained and mounted in the same manner and at the same time as the pathologic specimens. This in itself, to us, has been a very important control. The tissues were marked and detail notes made. The dissection was unusually careful, and with such accessible tissues as the viscera, sympathetics, and spinal intercostal fibres, there is no occasion for any damage being done. From the living tissue to the fixing fluid, no other method offers such a minimum of time for post-mortem changes. The pathologic changes are unquestionably ante mortem, not post mortem or artifacts. They are acute changes, not chronic ones. The changes correspond to the osteopathic lesion and this was shown by a variety of technique methods. Finally, clinical data bear us out. Probably a section of certain nerve fibres (other than has already been done) contiguous to the spinal structures would reveal some interesting data, but this requires a high degree of surgical skill, and, moreover, a thoroughly trained physiologist can do it better, and we have access to their contributions.

CONCLUSION

In conclusion, therefore, the following points are submitted bearing upon the theoretical and practical interpretation of the osteopathic lesion. It seems logical, in view of the above facts, that the explanation of the osteopathic vertebral and rib lesion rests upon something more than mere pressure of maladjusted tissue upon nerve fibre or vascular channel: this at best can be only a part of the pathological process. In the first place, there is a physiological disturbance of the muscular, fascial, ligamentous, and osseous tissues, which causes interference with the normal afferent influences to the spinal-cord centres, and this is more or less permanently maintained by the lack of freedom of the normal joint movements. This obstruction of normal afferent stimuli is only the initial step, for disturbance of innervation through the mechanically-changed relationship of the structures, physiology teaches us, initiates a corresponding and dependent change in the spinal cord segment. The immediate contraction of the muscles, for example, and their maintenance show this to be the case. Such interference of the ever-constant nerve force must necessarily disturb functioning, and, as a consequence, the subsidiary vaso-motor centres, with others, are affected. Mere inhibition of part of the nerve

current, causing resultant disorder of certain reflex arcs, would probably affect nutrition. But we find vessel relaxation and congestion a prominent feature. The arterioles, capillaries, and veins are pathologically affected by the disturbed innervation. The blood stream is slowed, the endothelial tissue compromised, and plasma exudation takes place. This is followed by diapedesis even to the frequent extent of haemorrhagic foci, especially in and about the nerve centres of the cord and ganglia; and thus nutrition of the local parts is jeopardized. This, then, means that the nutritional centres, the ganglia, will not receive their full quota of nourishment, and thus the integrity of the neurone is impaired and primary parenchymatous degeneration follows. This, we believe, is the explanation, or at least an important part of it, of the pathologic inception of the osteopathic lesion. Many factors may eventually prove to be important contributing features, for example, toxins, but our special purpose here has been, if possible, to offer an initial working basis.

Neither macroscopic nor microscopic findings of the tissues passing through the spinal foramen warrant the assumption that the osteopathic lesion is the result of mechanical pressure *per se* in this region. No doubt strains and tension of the fibrous and connective tissues here, as elsewhere (and possibly even more so owing to the firm anchorage of the tissues), would have their effect upon nerve impulses and vascular channels, but the histological findings are no more pronounced here than in other structures. There is nothing in the examination to lead the writer to conclude that the foramen is distinctly lessened in diameter so that it encroaches upon the conducting organs, or that there is distinct pressure upon artery, vein, or nerve. The morbid histology is the same here as in the corresponding parts. Naturally, it would take but little strain to disturb nerve currents, but it is in the ganglia that the greatest vascular change occurs, not along the conducting fibres. Although vasomotor tone, locally, even to the point of diapedesis, may be changed by mechanical means or trauma remote from a centre, still it seems to us that the phenomena of the osteopathic lesion, clinically and pathologically, point distinctly to a central or focal irritations in the cord; and, moreover, the changes in the spinal nerve, artery, and vein would be localized in character, resultant changes would be different, and pathologic involvement less systemic and less evenly distributed if the lesion was primarily a blockage at some point within the spinal foramen. Moreover, the degeneration is not Wallerian after the manner of a distal end separated from its centre. Two or three anatomical features stand out prominently in the dissection of the spinal-column tissues, viz, the close

contact of the spinal nerve, artery, and vein to the superior border of the rib and their firm anchorage within the foramen, clearly exhibiting how easily maladjusted vertebra or rib may disturb these tissues; the fairly loose anchorage of the sympathetics, by the parietal layer of the pleura, along and near the head of the ribs, also suggesting that rib lesions may disturb sympathetic integrity. However, at best, from our observations, pathologic changes here can be only a part of the entire morbid picture.

In the large majority of cases only a portion of the cells are affected, likewise the axones. Segments of the cord, as is well known, are neither histologically nor physiologically isolated, so to speak; neither is the osteopathic lesion a complete severance, organically or functionally, of a certain segment.

Certain paths are more disturbed than others; and from all indications the entire neurone suffers, thus pointing, nutritionally, to a central effect, with a corresponding disturbance to the subsidiary and collateral neurones. This accounts for the pathologic changes in near-by segments and ganglia, and, indeed, for the effect upon related viscera. No doubt the majority of these early changes are amenable to treatment, for the degeneration has not often gone beyond a stage of repair. Many lesions, if not all, unquestionably lower the amount of vitality a related tissue or organ should receive, and thus are important predisposing etiologic factors.

Nervous tissue, particularly the ganglia from the cord to the sympathetics, and the connective tissue are richly supplied with blood. This point cannot be too greatly emphasized. Osteopathically, the greatest disturbance seems to be in these nerve centres. Owing to the sensitiveness of nerve cells to circulatory changes, it is a slight step from functional impairment to organic disorder. When such occurs it is only another short step to visceral impairment. The same lesion, apparently, may affect the tissues differently – that is, as to precise locality – although all lesions affect the tissue more or less the same way pathologically. Physiologically and clinically we know, owing to the neurone morphology, that certain paths are related anatomically and physiologically to different segments; likewise tissues and viscera to different segments. Practically, a thoroughly relaxed structure and a definite technique are conducive to either production or correction of the osteopathic lesion.

There can be no question experimentally, as is well known clinically, that the osteopathic lesion is an important etiologic factor in visceral perversions. We have touched upon the probable pathologic explanation,

the importance of vaso-motor disorder, in explaining the pathogenesis of visceral lesions wherein the osteopathic lesion is the etiologic factor. It would seem that Dr. Louisa Burns' excellent experimental work would have an important bearing upon this point. However, this phase of the work, as also the remaining portion, is presented for what it may be worth. This is merely a start; but we feel justified in saying that we firmly believe the experimental side of osteopathy, like the clinical, merits the earnest attention of the entire profession. We are content for the moment, as has been stated, to let the facts speak for themselves; theoretical interpretation to a finer degree rightly comes later, when we have much more data. There is an additional practical point we believe should be specially emphasized, namely, the importance of leaving the osteopathic lesion alone when once something has been accomplished. Dr. Still has continually spoken of this, and experimental work substantiates it. Too many of us treat too often and too hard, and thus do not allow nature a fair opportunity to repair the weakened tissues.

This article is an outgrowth of our previous studies as presented in the *A.O.A. Journal* of September and December, 1905, and May and August, 1906, supplemented with many additional experiments. (To the interested reader we would suggest a supplementary reading of the first three articles.) A list of references was appended to the above articles. In this particular contribution the following works were, in addition, specially helpful: the *Pathologies* of Thoma, Schmaus, Adami and Hamilton; Louisa Burns' *Osteopathic Writings*; Quain's (eleventh addition) and Santee's *Anatomies*; Morat's and Howell's *Physiologies*; Szymonowicz's *Histology*; Williamson's *Spinal Cord Diseases*; Bevan Lewis' article in Allbutt's *System*; J. Mackenzie, *Symptoms and Their Interpretation*.

The following photomicrographs, giving greater detail, to which the foregoing is largely introductory, are submitted. The figures represent various tissues between the second cervical and thirteenth dorsal. Nearly all are from lesions of one to four weeks' standing, as it has been the writer's purpose to study mainly early changes.

OSTEOPATHIC STUDIES

CARL P. MCCONNELL

The cervical spine and the ribs cervical spinal lesions should be studied in conjunction with the condition of the upper dorsal region. From a mechanical standpoint they may be secondary to dorsal lesions, which in turn are not infrequently due to lumbo-sacral distortions. Many cervical lesions, however, are primary lesions. Faulty posture, imbalance of muscular tension, poor muscular development and exhaustion are among the underlying predisposing factors. The constant attempt of the body to maintain an upright position, whereby it instinctively rotates into the frontal plane, may under certain conditions establish various local lesions and curvatures. The combined effect of the slumped posture and the continuous balancing of the body in the frontal plane account for a large number of spinal deviations which embrace both the lateral and sagittal planes.

The mechanics are complicated. One may view the therapeutic problem from two aspects: first, noting configuration from the curvature standpoint and applying exercises of a corrective nature, which will be more or less successful in the early cases and beneficial in all. Second, noting the series of local osteopathic lesions, analyzing the relation of the lesions to the curvatures and adjusting each lesion individually. It is essential, however, to locate the key lesion or lesions, many of them being secondary. Not infrequently curvatures are directly the result of a deep-seated osteopathic lesion.

A definite lesion will be found at either end of a curvature and oft-times at the point of its greatest convexity. Except in cases that are not thoroughly organized or fixed nothing less than specific operative interference with the local lesion will secure satisfactory results. The indications in each instance are to adjust the local lesions, re-establish a normal alignment of the curvatures, insist upon proper exercise and posture and correct the environment. Many of the lesions are not especially disturbing (illustrative of the natural resources of the body and the factors of safety) unless exciting factors enter the clinical picture, such as toxæmia, infections, atmospheric effects, etc. But nevertheless the osteopathic lesion is a potent predisposing factor. This is nowhere better illustrated than in lesions of the cervical spine.

In diagnosing and adjusting lesions of the typical cervical vertebrae, it is necessary to keep the direction of the articular planes in mind. The physiological test of articular movement is an essential diagnostic point, and in order exactly to determine it one should be especially careful in locating the fulcrum. Although the capsular ligaments permit of considerable freedom of the articular planes (more so than of either the lumbar or dorsal, the latter being the least). still in chronic cases, and especially where trauma is a factor, the ligaments are particularly involved. Consequently both in diagnosing and in adjusting these lesions a fixed point or fulcrum should be made by placing the fingers of one hand directly beneath the spinous processes, the patient lying flat upon his back. This enables one firmly to immobilize any one section or area of the cervical spine. Then with the fingers of the other hand around the occiput one is in command of a lever which can flex, extend, or side-bend and rotate, or stretch any segment. It is important to remember the direction of the articular planes; approximately at an angle of forty-five degrees to the longitudinal cervical axis.

The hand around the occiput should hold the cervical spine in easy forward-bending. not enough to tense the capsular ligaments. Then with a slight traction accompanied by a combined localized rotation, side-bending and forward-bending each articulation may be tested, provided the fingers under the spinous processes are making a fulcrum of each segment in turn. In addition to the test of physiological movement one should use the thumbs for palpating the articular processes, not forgetting that lesions of the planes are occasionally accompanied by slight bony outgrowths. It is necessary to remember that the spinous process is about opposite to the articular process of the vertebra below.

After determining the character of the lesion it is comparatively easy by the above leverage to make adjustment, care being taken not to attempt too much at one treatment. Applying a force approximately parallel to the articular plane (the spine being in moderate forward-bending) by a combined movement of first side-bending and then rotation is usually not difficult provided the fulcrum is well located and stabilized throughout the operation. For example, a lesion between the fourth and fifth requires that the fingers of the one hand should be placed around the lower spinous processes, that is from the fifth downward, letting the thumb rest on the articular process. Then the fingers of the hand around the occiput, thumb along side of articular processes, are in a position to apply a very effective leverage. In this position one has control of any combination of

movements and angles. Neither extreme flexion nor extreme extension should be employed. Do not forget that the lower anterior margin of the body of the axis is prolonged, which restricts forward-bending at this point.

By keeping the spine either in moderate flexion or moderate extension and on slight traction any liability to undue strain will be prevented. Hypermobility cervical joints are usually compensatory to a rigid upper dorsal area.

THE RIBS

Lesions of the ribs comprise one of the important fields of osteopathic pathology. Involvement may be of a single rib, a group, or one side of the chest, or partial immobility of the entire chest. Owing to the intimate relation of the ribs to the sympathetic ganglia, any abnormality of rib positions may involve the functional activity of chest and abdominal viscera. Lessened mobility of the thorax frequently affects the bone marrow of the ribs. Derangement of the lower ribs is especially apt to affect the functioning of the diaphragm. Upper rib mobility is essential to the freedom of cardiac innervation. Lesions of the first rib frequently involve several important nervous tissues and vascular channels. There is probably no part of the body structure that requires greater attention to precise mechanical details than the ribs. Dr. Still always paid particular attention to their condition.

In the study of the thorax, as of the spine and pelvis, one should not lose sight of perspective, that is the inter-relation of the part to the whole. The importance of the whole body as a working unit should be constantly kept in mind. The lesioned body is subject to continuous change of adaptive and compensatory influences. In other words, it is the mechanism as a whole that should be clearly outlined before any therapeutic application is attempted. All of the parts, segments and sections are something more than structural mechanisms. Although there are very precise mechanical relations and the disturbance of these have far-reaching effects even on the plane of physical mechanism alone, the effects on nerve impulse, reflex arc and vascular channel are significant. A general function is the combined result of many mechanisms.

The articulations of the costal cartilages and of the sternum, as of the costovertebral, present distinct local mechanical relations subject to individual lesions. There are other factors to be considered on account of the interdependence of all these parts. The chest wall readily adapts itself

to changed conditions of the dorsal spine, to posture and to diseased conditions of the thoracic viscera. There is considerable elasticity of the cartilages and ribs, and the soft tissues attached to the thorax markedly influence thoracic motion. Immobility of the region is readily discerned through the tactual sense.

The majority of rib lesions are secondary to vertebral abnormalities in the dorsal regions, although they may occur as primary lesions owing to the independence of movement. In lateral dorsal curvatures the transverse process carries the vertebral ends of the ribs backward and upward on the convex side, separating them and increasing the rib angles. On the concave side the vertebral ends are depressed, closer together, and the rib angles are less acute. Owing to the close association of spine and ribs, any of the types and sub-types of dorsal lesions will change the position of the ribs, although the free movement of the ribs may compensate for relatively small displacements of the vertebrae. An extended position of the dorsal spine will carry the vertebral end downward and the costal upward, and the converse position of the spine will have the opposite effect.

The movements of elevation and depression of the ribs, unassociated with the movement of the dorsal spine, result in an increase and decrease, respectively, of the antero-posterior and lateral diameters of the thorax. The axes of movements pass, the oblique axis, through the costovertebral articulations, and the sagittal axis through the costovertebral and chondrosternal articulations. In diagnosing lesioned conditions great care should be exercised, for there is normally considerable variation in several of the ribs. In addition, age, configuration and status of health are modifying influences.

An elevated displacement of the first rib is one of the most common rib lesions, the movement being largely through its sagittal axis. Depression of this rib is comparatively rare, displacement is readily diagnosed by comparing the positions, and especially the mobility, of the two sides. By placing the fingers over the middle third of the rib and partially circumducting the cervical spine with fulcrum at first dorsal segment, one can easily detect the degrees of mobility, which is a most significant index. Most of the first rib lesions are due to abnormal tension of the scaleni muscles, which may be of primary origin as from atmospheric changes, though involvement from postural strain, upper respiratory infections, and lesions of the cervical spine affecting the muscle innervation are common. When one first rib is elevated it tends to rotate the body of the first dorsal

vertebra toward the opposite side. In clinical work it should be remembered that there are strong fibres connecting the head of the rib and the seventh cervical vertebra. In older individuals there may be ossification at the attachment to the sternum, forward bending of the shoulders and head, absorption of intervertebral discs and other senile changes to be taken into account. Some degree of arthritis of various rib and vertebral articulations is fairly common.

Lesions of the first rib are of more than ordinary importance because of the close relations to the subclavian vessels, the brachial plexus, first thoracic nerve and the sympathetic ganglia. In addition to this, elevated displacement disturbs the lymph drainage from the neck into the thoracic ducts. There is an intimate association between the lymphatics in the regions of neck, upper chest, axillae, scapulae and mediastina.

The second rib moves freely in its sagittal axis. Its oblique axis is less limited than that of the first rib. There is greater lateral expansion. Part of the first rib muscle system acts upon the second rib. Occasionally there is displacement at its costal attachment. More frequently lesions of this rib are associated with displacement of the corresponding vertebra. Flexion-side-bending-rotation of the second dorsal is a common lesion, causing involvement of both second ribs. A particularly difficult lesion to correct is where there is an appreciable side-slipping of the vertebra associated with the above, firmly immobilizing the entire vertebro-costal segment.

The third, fourth and fifth ribs are more apt to be displaced than the second. Beginning with the third, the tubercle moves more freely on the transverse process. In this region, lesions may disturb the cardiac and thyroid innervation, and vasomotion to chest and upper body. The intimate relation of the sympathetic ganglia to the stellate ligaments is an exceedingly important osteopathic point.

The middle section of the thorax presents the two axes of motion to full advantage. The axis of rotation is so movable that the elasticity of the ribs may be often utilized in certain adjustments, by placing the patient on his side, standing in front, applying pressure just back of the mid-axillary line and springing the rib upward and backward.

Beginning with the eighth rib, the lower ribs are progressively freer in their movements owing to the attachment at the transverse process being less tense, and the anterior articulation more movable.

The last two ribs are in a distinctive class, being freely movable in all directions. Their downward and backward displacement causes fixation of the posterior costal attachment of the diaphragm, which is an important associated feature of enteroptosis. Physiological contracture of the quadratus lumborum pulls the twelfth rib downward, and to a certain extent the eleventh. These ribs are frequently displaced in various positions resulting in considerable disturbance. The close relation of the twelfth to the ilio-hypogastric and ilio-inguinal nerves is an important point to remember.

From the above brief reference to a few outstanding features of rib lesions, it is readily seen that the structural mechanisms operate under definite mechanical relations, although modified by the morphological and functional conditions of the organic unit. It is essential that these two aspects be kept clearly associated. The types of lesions are distinctive, requiring precise diagnosis and therapeutics, yet, owing to modifying and compensating influences great care should be exercised in integrating the whole complex organism.

RIB TECHNIC

Abnormal depression of the lower four or five ribs, either unilaterally or bilaterally, is a frequent lesion. The effect upon the costal attachment of the diaphragm is marked, pulling it downwards so that its axis approximates that of the crura, resulting in a lessened diaphragmatic excursion.

Place the patient upon his side with lesioned area uppermost. The arm underneath the chest should be brought forward. Rotate the chest forward and slightly flex the same so that the combined angle of rotation and flexion is directly over the involved ribs. The physician, standing back of the patient, reaches underneath the distal end of the upper thigh, and, by using the thigh as a lever, rotates the upper pelvis and lumbar area backward on the chest at a point corresponding to the rotation and flexion of the chest, which should be, as stated, directly over the lesioned ribs. It is important that the counter rotary effect be exactly placed. Changing the length of the thigh lever will raise or lower this point of rotation on the longitudinal spinal axis. Preliminary testing of the position of the patient so as to accurately locate the combined leverage effect is necessary. One should also check tactually the extent of muscular and ligamentous involvement. Place the palm of the other hand upon the posterior third of the involved ribs. Then with patient in fairly easy position, chest rolled

forward and slightly flexed, and thigh, pelvis and lumbar section rolled backward and slightly hyper-extended, have him take a deep breath. At the moment of beginning inspiration, the physician carefully pulls backward and downward (limb off table or bed) on the thigh leverage with one hand, while the other hand forces the lesioned ribs forward and upward. Synchronous action of the weight of the forwardly rotated chest, of the thigh leverage, of the deep inspiration and of the release and adjustment of the ribs by the hand placed over the ribs is essential. Each of these forces tends to release and elevate the ribs, stretch the restraining ligaments, contracted intercostals and quadratus lumborum.

The same treatment is applicable where the abnormal depression is confined to the eleventh and twelfth. This is a very common involvement. Even in cases where the twelfth is elevated, with anterior end almost underneath the eleventh, the above levers are effective; especially if the quadratus lumborum is put on a thorough tension, while the hand against the rib pushes it well forward so as to release its vertebral attachment.

In cases where there is considerable chest immobility. it may be necessary to increase the mobility of the upper and mid-chest prior to the adjustment of the lower ribs. In such instances it is well first, to place the patient on his side and stretch the dorsal vertebral ligaments and discs as outlined under dorsal technic. Then with the patient flat upon his back, place a small pillow underneath the upper dorsal so that it is flush with the shoulders, the head lying comfortably on the table. Reach underneath the patient, palm of hand upward, and place the fingers against the angles of the upper ribs so that the wrist and forearm are supporting the shoulder and upper arm of the patient, the forearm and hand of patient being between operator's arm and chest. The patient should be thoroughly relaxed and comfortable. Place the other hand over the costal ends of the corresponding ribs. Now exert traction outward and upward at about an angle of forty-five degrees, in the transverse plane of body. The fingers should be firmly against ribs, the upper part of hand supporting shoulder and the forearm and elbow pressing patient's arm against the operator's lateral chest. One then will be in a position so that one's weight, by pulling backward does most of the work. At the moment of pulling backward have the patient take a deep inspiration. At the exact instant of this beginning inspiration the hand over the costal ends of the ribs exerts a firm but gentle upward and outward pressure. All three of these forces should be applied synchronously. Do not neglect to have the dorsal spine moderately hyper-extended. This is especially effective from the second to fifth ribs inclusive.

Should the upper anterior chest be particularly immobilised or rigid have the patient sit up. The physician stands or sits back of him, so that the patient can lean his head directly against his shoulder. Place one hand against the mid-dorsal spine and the other underneath the axilla and over upper anterior ends of ribs. The hand against the spine is to keep the chest balanced while at the same time maintaining moderate hyperextension. Then at the moment of beginning inspiration increase hyper-extension with one hand and elevate the anterior ends of ribs with the other. The same levers may be employed if the patient sits high enough on a table and well back against physician's chest while both hands are placed underneath the patient's axillae and over anterior chest. If hyper-extension and beginning inspiration are well timed very little effort over chest will release the costal ends of the ribs.

Follow up this technic by placing patient on his side, knees slightly flexed so that one limb may comfortably rest upon the other. Have the head and neck of the patient extended a trifle backward. Reach underneath upper arm so it will be supported in a relaxed position, placing the hand across scapula. With the other hand over the posterior third of the middle ribs exert a pressure, during the interim of respiration, upward and backward simultaneously with upward and backward movement of the patient's shoulder, using fingers over scapula as a fulcrum for the latter movement. This will frequently release the ribs.

Normalising an immobile chest is a part of the work required for structurally integrating the body. This is frequently overlooked, especially the relation of thoracic integrity to abdominal and pelvis competency. No matter how important it is structurally to adjust the dorsal spine, the transverse area of the chest and its ventral aspect should not be neglected. Indeed, without careful attention to the chest walls the spinal section cannot be thoroughly adjusted.

The majority of single rib lesions are secondary to vertebral lesions, although the ribs may be displaced independently of spinal conditions. Where the two corresponding ribs on either side are displaced, it is almost invariably due to a spinal lesion. Many of the rib lesions are automatically adjusted when the spinal lesion is normalised, but owing to fibrotic involvement they may require special attention.

As a rule singly displaced ribs are not difficult to adjust if one spends a little time on detailed diagnosis. The rib may be adjusted when the patient is lying on his side or sitting on a stool. If the latter position is used (the

same principle is applicable to both positions), it is best for the physician to sit on the treatment table directly behind the patient. Height of stool and table should be adapted to the operation. In this instance the anterior superior tubercle of the tibia should be used as a fulcrum. Exact placement of the same over the rib near the attachment to the transverse process is necessary. Then while one hand grasps the arm of the patient above the elbow so that the arm and shoulder may be pulled upward, outward and backward, the fingers of the other hand are placed on the anterior end of the rib in such a position that they can exert pressure either upward or downward depending on the type of lesion. Perfect balance and support of the patient, accurate location of fulcrum and specific application of adjustive force are the factors of the operation to have under thorough control. Then have the patient exhale, and while doing so arrange all leverages so that they are exact. At the moment of beginning inhalation use the arm lever to force posterior portion of rib into place, while at the same time the fingers over the anterior end adjust this part.

There are many methods for adjusting rib lesions. Care, however, should be taken that the force applied in adjustment is not too great, especially in elderly patients. The costal cartilages may be independently lesioned. In acute rib lesions it may be well to apply adhesive tape as in care of fractures until the acute congestion has subsided before attempting reduction.

The first rib is frequently lesioned, especially in an elevated position, being rotated on its sagittal axis. Stand behind the patient while he is sitting on a stool and place the middle fingers of one hand over the middle third of the rib. The other hand is placed over the crown of the head so that the head and neck may be used as a lever. The patient should be carefully balanced, particularly the upper spine. Slightly leaning the mid-dorsal against the physician will help maintain the required balance.

Sidebend the head and cervical spine so that they operate as one lever. The side-bending should be to its maximum point, and maintained for a few seconds till the lesion is slightly exaggerated and the scaleni begin to relax. Without releasing the lateral tension, gradually and fully circumduct the head and neck toward the frontal plane. Anticipate the point in the circumduction where the pull or tension on the scaleni disappear by quickly pressing downward on the middle third of the rib, thus adjusting the lesion. The various steps should be carried out as one continuous operation. The release of rib anchorage, the maintenance of mobility by extreme

circumduction, and timing of the adjustment pressure just prior to and succeeding the release on scaleni are the principal points to keep in mind. This method is applicable to all cases. Be careful when applying the method which sidebends the head toward the lesion followed by a sharp thrust over the rib. Much depends on the underlying pathology.

SOFT TISSUE TECHNIQUE

CARL P. MCCONNELL

There are three fundamental facts which, in my opinion, the technician should keep constantly in mind: (a) the incessant physical activity of the body; (b) the whole body, comprising every plane, is the functional unit; and (c) the resident (organic) and environmental (internal and external) forces constitute one process. These forces are not disparate ones from the standpoint of organic activity. In other words, the organo-environmental solidarity should never be forgotten.

Owing to the above facts soft tissue work should not be overlooked. The problem of technique, pathogenetically, is one of dynamics rather than one of statics because disease is emphatically a process. Disease is a state or condition of the body which is constantly changing its manifestations. For this reason, as well as the significance of the functional purposes of structure, osteopathic technique is definitely and distinctly apt and potent.

The problem of technique is not one of osseous adjustment versus soft tissue work. Neither is technique a matter of simply spinal adjustment. Nor is it resolved, per se, into an equation of statics. Fundamentally, technique is coloured by the pathological background. It is owing to this fact that the operational factors are highly important biologically. Essentially the problem centres in the specific conditioning, particularly the environment, of the cytoplasm of the cell. This means that environmental influences are of moment, in which the principle of mechanical integration enters as an ultimate physiological element. It is thus evident that all tissues of the body modify the part, and in turn the part reciprocally modifies the whole. Hence the significance of the complete body being the functional unit, which of course includes both the soft and osseous tissues.

The problem of soft tissue work may be approached from the standpoint of movement. Certainly the bones don't move of themselves. Malapposition is due to resolution of the forces incepted by tensions, strains and stresses of the soft tissue; particularly of the muscles, fascia, tendons and ligaments. The cumulative effects of sustained impacts, environmentally affected, posture, for example, are unquestionably productive of innumerable lesions, no less significant than those lesions accidentally incepted. In all instances change of environment, either normal or abnormal, is part of the physiological process. Thus, no

argument is required in setting forth the import of the total pattern in all classes of tissue.

From the viewpoint of technique, a striking illustration of the foregoing is depicted when one studies a case from the aspect of function. I am inclined to think this is a neglected field. Too much of our lesion analysis is statically bounded. If one will analyze a case under working or functioning conditions, that is, in accordance with the daily regimen, and specifically study the lesion region dynamically, that is, functionally when the patient is sitting or standing, one will have a far different conception of lesion pathology than may be obtained by any other method. This of necessity will get one out of the groove of mechanical routinism, will emphasize the always individual nature of a case, and will give technical clues of the first importance.

After this manner, soft tissue work will loom big in the field of technique. Not that it is, or can be, a substitute for interosseous specificity, but instead it will add invaluable clues to both the pathogenetical and technical (operational) fields. A pathological point of prime importance, for example, is that osseous malalignment is sustained by ligamentous rigidity. This rigidity is incepted by way of muscular, fascial and tendinous tensions and stresses. Every case portrays an uniqueness in accordance with location, architectural plan and laws, tissue texture, regional and strength ratios, resident properties, environment settings, resolution of forces, etc. Remember, I am speaking of the solid biological background of individual pathogenesis, the veritable soil of pre-diseased conditions. This is the stronghold of osteopathic theory and practice.

Abnormal tension processes are not of course consonant with normal physiological activity. The capillary-bed and the nervous lymphatic afferentia are especially involved by abnormal tension effects. Herein, it would seem, is the inception of many lesion rigidities or panels of immobility which are somatic correlates of the physiological activity of a so-called segment. These panels of immobility are strikingly portrayed when a study of the vertebral lesion is made with the patient in the sitting position, for illustration. The same is true of costal cage rigidities, of the lessened excursion of the diaphragm, and of abdominal and pelvic incompetence. The importance of soft tissue work is obvious.

The lack of either sufficient or efficient soft tissue work is one reason for mediocre technique and recurrence of lesions. The same is evident in the correction of postural defects. Allied with all technique should be the

thorough investigation of the environmental factors. Permitting the patient to drop back into poor hygiene, wrong environmental contacts and bad habits is simply inviting a recurrence of lesions and further pathological involvement. Circulation is deranged and impoverished, nervous and chemical co-ordination is disturbed, and immunity is lessened. It is the co-ordinated and organized sum total of the regional or area requirements that determine systemic consonancy. For this reason every soft tissue, osseous or organic lesion has a profound effect upon the whole body. This is a physiological fact which seems to be frequently overlooked. Repair, growth and development, no less than the required solvents and ferments, are dependent on the mutually interdependent organization of all tissues and organs. In fact, this is what constitutes an organism. Differentiation and specialization of tissue and organ, each of which has a dominant characteristic, is a requirement, the significance of which goes back embryologically to the highly endowed mesenchyme, for example. But no mistake should be made in overlooking the spatial relationships of molecules, cells and various units, so necessary for circulatory requirements, gaseous interchanges, and afferent stimuli, in which mechanical integration is a basic need. Hence the importance of not only osseous adjustment but also of soft tissue adjustment.

What may be termed a classical illustration of the potency of the soft tissue lesion is found in certain cases of herpes labialis: those due to constriction or pressure of the soft tissues over the mental or infra-orbital foramen. These may be instances following exposure when the weather is cold and windy. An entire gamut of fundamental pathological changes in the local tissues may be the result. Relief and recovery are quick in these instances when the impingement over the foramen is released. Similar quick responses are notable when diaphragmatic excursion is increased in cases of mediastinal glandular infection and in disturbances of the pericardium: in the elevation of the duodenum when peptic ulcer follows tension of the duodeno-hepatic ligament; in the release of the scaleni where lower cervical glandular drainage is involved; in the adjustment of the sigmoid-rectal juncture and malrelationships involving the sub-mucous coat of the rectum and associated veins, etc. The number of illustrations are legion. A fundamental osteopathic pathology is common in all cases. Exactness of adjustment is the technical requirement.

Osteopathic technique is basically adjustment, that is, precise anatomical release. It is neither stimulation nor inhibition. No more so than it is repair or healing. The body is endowed with the properties of self-

adjustment, self-repair and self-recovery. The osteopathic technical problem is definitely one of assisting nature consonantly and by means of adjustment along desired lines. This brings us back to the original premise of organo-environmental change. But the assistance should be distinctly appropriate because recovery of health is an attainment.

Consequently, the soft tissue technical need is one of anatomical readjustment, exactly similar in principle to interosseous readjustment. There can be no evasion of the underlying biological principle. But there are an infinite number of applications of the principle because the uniqueness of each case even a difference of the pattern following each, effective treatment, is a reality. This is why correct osteopathic treatment is specifically appropriate and particularly difficult. The reactions of structural minutiae, the tensions, strains, stresses, immobilities, mal-relationships, etc., demand detailed elicitation, analysis, interpretation and technical adjustment. The difficult case oft-times requires extended search for one may be certain that there is blockage of vessel, nerve, chemical messenger, solvent, or ferment at some point in the organism. Very likely it often rests in some critical or strategical region of the body. An involved radix mesenterica, a tensed renal system, a contractured quadratus lumborum, an immobilization of pyriformis fascia, or axillary sling, a contractured hyoid mechanism, etc., are examples of soft tissue lesions which are frequently overlooked.

There is no royal road to their correction any more than there is to a surgical operation, or to a postural readjustment. Again it is search and elicitation and technical normalisation. There can be no formula to follow except in principle. The forces which change structure must be attacked, commensurate with indications and requirements. If this can be accomplished, nature will do the healing. Operationally, this first means palpation, then more palpation, followed by interpretation of the structural registrations or indices for structure in motion or physiological activity, which is always incessant. Never overlook the fact that the mechanical principle is just as inherent, just as vital, as the principle of chemism. In the final analysis, the primary object of technique is to change the specific environmental conditions, for all physiological activity, including the pathological is a process, and signs and symptoms are reactions.

Consideration of the "internal" environment, that is of the capillary-bed (the site of a marvellous laboratory), the extensive afferent mechanisms, and the inter- and intra-cellular interfaces, may give us a different conception of

soft tissue work from that which we have previously held. We shall begin to realize that all tissues are specialized ones (at least have characteristic properties) and that connective tissue separations and associations are highly important. Such a viewpoint is sound physiology; and what is of great significance osteopathically is that the mechanical principle is vastly extended. This implies that one is close to the course of beginning disorder. But it does not mean that the generic principle of circulatory integration is to be neglected. It is the specializing of the application that is important technically. Neither does it mean that the great co-ordinator, the nervous system, is to be forgotten. And the principle of co-ordination extends to the chemical messengers. For, in fact, maintenance of co-ordination is the important general fact of organic existence. But the contribution of each area is essential to the whole and as a consequence each and every tissue assists in fulfilling the underlying plan and purpose.

A method of lesion study of great practical merit, in my opinion, is to seat the patient with his back before you and carefully elicit the details of the whole spinal mechanism under functioning or active working conditions. With the patient carefully balanced, and by utilizing the flexed elbow as a lever for executing the various physiological movements, lesion pathology will readily become pronounced to the palpating fingers. The resolution of the tension forces will be readily noted. A notable feature is that the simplest lesions involve a far greater territory than one may previously suspect. Almost invariably a direct clue to technical solution is discovered because it is in the characterizing features of each case that the technical solution rests. Many lesions can be far easier adjusted in this position than in any other. One is thus engaging the parts under functioning conditions.

But before applying any technique continue the examination with the patient standing sideways before you. Note especially costal cage mobility, not only as a whole but also in detail; that is, at different levels. Observe the competence of the abdomen, also at different levels. Detect, in particular, the functional status of the diaphragm. Remember that this mechanism is probably the most powerful one of the whole body. It not only mechanically engages the tissues from the pharynx to the perineum several times per minute but it is physiologically indispensable to the activity of every cell of the body. A working knowledge of the crura, central tendon, and the extensive ramification of the diaphragmatic tissues graphically depicts the significance of structural continuity and functional

unity. The wealth of soft tissue work centring in this powerful mechanism is beyond compute; and clinically it is very practical.

Still our search of soft tissue conditions should not stop here. Place the patient in the knee-chest position and carefully, but thoroughly, palpate the abdomen and pelvis. Naturally all of the ventral plane is correlated with the spinal plane.

Another highly indispensable soft tissue region is the one of glandular correlation comprising the cervical, pectoral, axillary and upper mediastinal lymphatics. Soft tissue lesions in this extensive area may be easily overlooked. Although they are of great importance in upper respiratory infections, it should be recalled that there is definite physiological association with probable local osseous lesions and diaphragmatic incompetence.

No matter how important spinal examination is, it is at best only a half way measure. The functional unit, the complete body, nervously, circulatorily, chemically, muscularly, mechanically, etc., is always far greater, co-ordinately, than the sum total of its cells, tissues, products and systems. The organic and environmental forces should be studied in both detail and totality. The importance of soft tissue work should be self-evident. But it should neither be a substitute for, nor should it overshadow osseous adjustment. It is complementary.

IMMEDIATE EFFECT OF BONY LESIONS

LOUISA BURNS

In the following report the immediate effects of the bony lesions are given as they were determined by experiment. With this is associated a report of clinic cases in which the bony lesion was considered by the clinician examining the case to be a factor in the cause or the perpetuation of the disorders as given. In most of these cases recovery followed the correction of the lesion. In those cases in which recovery did not follow proper treatment, the failure was due to recognizable causes which did not interfere with the validity of the evidence in favour of the etiological place of the bony lesion. Cases in which there was any doubt concerning the place of the bony lesion as a factor in etiology were not included in this report. Nearly all of the case reports were taken from the records of the general clinics of The Pacific College of Osteopathy, the others are from my own limited practice.

The conditions of the experiments were as follows. The animals used in the work were cats, dogs, guinea pigs, and white rats. These were condemned to death by the exigencies of civilized life and the superfluity of their numbers. In every case the animal was given some anaesthetic-usually ether-to the point of surgical anaesthesia. None was ever permitted to regain consciousness after once losing it. In the tests described in this report, the bony lesions were secured by the pressures of the fingers upon the vertebral spines.

Naturally, no anaesthetic was given the human subjects. These were usually intelligent men and women, of varying ages, all in good health, and all ignorant of the nature of the reaction to be expected from the experiment. The tests were often repeated upon the same subject, and if any appreciable differences were apparent, either the cause of the variation was determined, or, if that were not possible, the results of the experiments were laid aside for further study. None of these doubtful results is included in this report.

The "reaction time" determination referred to in connection with lesions of the cervical vertebrae was used through a suggestion from some work of Professor Hugo Munsterburg of Harvard. Lists of fifty unrelated words were prepared, and two such lists were used. The time necessary for the repetition of these words was determined for each person by actual timing

of the reading of the lists. The lists were read to the subject, who gave, in answer to each word, some word which presented itself to him in consciousness. The time needed for the pronouncing of one hundred words and giving the answer, less the time needed for the pronouncing alone, represents the time needed for one hundred mental acts of a very simple order. In making these lists care was used to choose similar words, fairly familiar to every person, and the same list was not given the second time to any person until after at least a month had intervened. If any appearance of an emotional reaction was noted, as, for example, a decided increase in the reaction time associated with the recognition of any word associated with memories of an emotional type, then these subjects were excused for the day, and other lists provided for later tests.

We endeavour to use the time required for the performance of mathematical problems as a criterion for the celerity of mental actions, but although these tests gave results qualitatively similar to those observed in connection with the "reaction time" tests, yet we have not yet been able to work out any satisfactory method for the computation of the time required for the more complicated mental acts.

The experiments upon human subjects include also some tests regarding the effects of bony lesions upon the sphygmogram and upon the blood pressure. The records are to be tabulated and made the subject of a later report.

LESION OF THE MANDIBLE

The subjects for this test were human. The saliva was collected for fifteen minutes and saved. Then for fifteen minutes the mandible was held in a slightly abnormal position and the saliva collected during this time. Then the mandible was released and the saliva collected during the succeeding fifteen minutes. During the forty-five minutes required, the subject was reading some light literature sufficiently interesting to hold a mild degree of attention. The three samples of saliva were then measured and the alkalinity, specific gravity, and amylolytic powers determined. The alkalinity was determined by litmus and lacmoid. The specific gravity was determined by means of an ordinary mercury tube. The amylolytic power was determined as follows. Equal amounts of saliva and thin boiled starch were mixed and placed in test tubes of equal size. They were then incubated together at a temperature of about 96°F. At fifteen-minute intervals the mixtures were tested for sugar. All tests were negative when the tubes were

placed in the incubator. Haines and Fehling's solutions were used for the sugar test.

Lesion of the mandible caused, in every case, an increased flow of saliva. The amount was usually nearly or quite doubled. In one case the amount collected during the lesion was three times that collected during the first fifteen minutes. After the correction of the lesion the amount approached the normal. The flow had returned to the normal amount before the expiration of the third fifteen minutes in each case. There was some variation in the exact time required for the return to the normal. The specific gravity was lowered during the time of the lesion. The specific gravity returned to the normal more slowly than did the rate of flow. The amylolytic power of the saliva was lessened by the lesion, and the amylolytic power of the third sample did not reach that of the first sample even at the close of the fifteen-minute test. Longer tests were not satisfactory on account of the difficulties of collecting the saliva during so long a time. No changes were noted in the alkalinity: at least, none were perceptible with lacinoid or litmus.

A slight hyperaemia of the buccal mucous membrane was noted during the existence of the lesion; this disappeared quickly when the mandible was released from pressure. Six people were used as subjects, and the tests were repeated several times upon four of them. The results varied in degree, but not in kind.

In the clinic reports is one history of a slight dislocation of the mandible during an eclamptic convulsion. The case appeared in the clinic after about six weeks. The jaw was fixed in a position which barely permitted the tip of a spoon to enter between the teeth. There had been considerable ptyalism during the whole time, and the skin around the mouth was inflamed from the drooling. No analysis was made, and the treatment prescribed was refused.

In another case the jaw had been wrenched and the tissues around the articulation were very sensitive. There was neither dislocation nor fixation. Ptyalism was pronounced, though there was no drooling. The saliva was not analyzed, since there was no normal for comparison. The correction of the muscular tension around the jaw was followed by lessened sensitiveness and the ptyalism disappeared within the hour.

ATLAS LESIONS

(1) *Animal Tests.* Cats and dogs, anaesthetized as above mentioned, were used in these tests. The organs whose action was to be noted were exposed with as little handling as possible. Care was taken to avoid pressure upon the vagus, either directly or by means of tension upon the surrounding tissues. If any changes in respiration or the heart's action were noted, the involvement of the vagus was suspected and the results disregarded, so far as the present report is concerned. The atlas lesion was produced by holding the skull firmly with one hand, while the fingers of the other hand pushed the atlas either left or right. No differences were noted in left or right malpositions.

The effects produced in this way by the atlas lesion are as follows. Dilatation of the blood vessels of the conjunctivae, the nasal, laryngeal and pharyngeal mucous membranes, the tonsils, the cerebral meninges, the external and middle ear, the marrow of the skull and, in some instances only, of the cerebral cortex and the basal ganglia. There was also dilatation of the pupils, increase in the flow of saliva, and contraction of the cervical muscles.

(2) *Human Tests.* In this test use is made of the "reaction time" as a criterion. The figures given are averages made from a number of tests made upon different subjects. Usually about ten tests were given for each lesion.

Before the atlas lesion the average reaction time was .5 sec. After the atlas had been held in a slightly abnormal position about ten minutes, the average reaction time was .7 sec.

Other effects of the atlas lesion were the face, conjunctivae, and nasal and buccal membranes were reddened; the pupils were dilated; the tears were increased, though this may have been a secondary effect; the saliva was increased, the subjects complained of dull, heavy feelings, of sleepiness, of headache, and, in some instances, not only complained of a feeling of irritability, but displayed signs of short temper. Questions requiring thought were not easily answered by any of the subjects while the lesion was present. The respirations became irregular and more frequent with frequent sighings.

(3) *Clinic Records.* Atlas lesions were considered etiological factors in the following cases:

Headache (4); melancholia (4); facial neuralgia (2); eye disorders (not due to refractive errors) (4); adenoids and deafness; chronic rhinitis (4); tonsillitis (2); hysteria (2); insomnia (2).

AXIS LESIONS

(1) The tests made upon both animal and human subjects gave results not to be distinguished from those produced by the lesions of the atlas.

(2) *Clinic Records.* Eye disorders (not refractive) (6); migraine (2); vertigo; tonsillitis (2); headache (6); facial neuralgia (2); pharyngitis; chronic rhinitis; otitis media; melancholia (2); insomnia.

Another case included in this list is given as “dyspnoea.” The patient was a child of five. He had had whooping cough six months before. The cough was said to have been unusually severe. After that he had been unable to eat because of an apparent inability to breathe while trying to eat. Even chewing seemed to inhibit the respiratory centre, as swallowing does in normal people. It was found that a decided axis lesion was present. Several treatments were necessary for its correction. The cure was complete and, at least for more than a year, when the last report from the child was received, was permanent.

THIRD CERVICAL LESIONS

(1) *Animal Tests.* The conditions of experiment were as already described. Lesion of the third cervical is followed by dilatation of the pupils, which is sometimes unequal. The eye of the side to which the pressure is applied is most affected if any difference is apparent. There is dilatation of the vessels of the conjunctive, the nasal, buccal, laryngeal and pharyngeal membranes and the thyroids. The cervical muscles were contracted in some cases; when this occurred the vessels of the meninges were dilated and there were signs of cardiac involvement.

(2) *Human Tests.* Lesion of the third cervical is followed immediately by pronounced discomfort, increased respiratory rate, dilated vessels of the conjunctivae, face, etc., increased reaction time, and sometimes a sense of nausea.

(3) *Clinic Records.* Acute coryza (3); epilepsy; chronic rhinitis; insomnia (3); facial neuralgia; conjunctivitis.

FOURTH, FIFTH AND SIXTH CERVICALS

(1) *Animal Tests.* Lesions of these vertebrae gave results not to be distinguished. There was always dilatation of the vessels of the nasal and buccal membranes, the thyroids, larynx and trachea. In some cases there was dilatation of the vessels of the meninges, brain, frontal sinuses and conjunctivae. Sometimes the cervical muscles were contracted, in which case the heart's action was affected in various manners.

(2) *Human Tests.* Lesions of these vertebrae caused extremely variable symptoms in the subjects tested. The symptoms included cardiac and respiratory irregularities, feelings of discomfort variously described, and usually reddening of the face and mucous membranes. The pupils were usually dilated, and the saliva was usually increased. The reaction time was increased, usually, in variable degree.

(3) *Clinic Records.* Insomnia (2); headache (7); facial neuralgia; goitre (4); adenoids (5); migraine; hysteria; pharyngitis (3); laryngitis; otitis media (2); tonsillitis (2); chronic rhinitis (2); melancholia; torticollis (2).

SEVENTH CERVICAL

(1) *Animal Tests.* Lesion of the seventh was followed by irregular respirations and heart beat, dilatation of the vessels of the pharynx, upper lobes of lungs, thyroids, tonsils, and sometimes of the nasal and buccal membranes, conjunctiva and meninges. Pupils sometimes dilated, often irregularly.

(2) *Human Tests.* Pupils were dilated, conjunctiva reddened; there was a sense of suffocation, irregular heart beat and respirations, pain in the arms and shoulders. After a time the heart became regular, and then it was found that an increased sensitiveness was present in the neighbourhood of the third and fourth thoracic spines. (This relationship was so infallible that it suggests the possibility of error in osteopathic diagnosis; i.e. that the increased sensitiveness near the third or fourth thoracic spines may lead to a neglect of some cervical lesion which is, perhaps, the primary and efficient cause of the cardiac arrhythmia).

(3) *Clinic Records.* Asthma (6) ; eye disorders (not due to refractive errors) (2); migraine; croup; insomnia (3); tonsillitis (2); hay fever (2); pharyngitis; chronic rhinitis (2); goitre (2); otitis media; quinsy; epilepsy; acne; adenoids (3); laryngitis; cardiac arrhythmia; cervico-brachial neuritis.

FIRST THORACIC

(1) *Animal Tests.* There was always a general dilatation of the cranial vessels, the thyroids, and the upper lobes of the lungs, and also a dilatation of the pupils, increased flow of saliva, rapid, weak pulse and shallow respiration, usually quickened.

(2) *Human Tests.* First, thoracic lesions produced a rapid and irregular pulse, sometimes becoming regular with increased sensitiveness near the third and fourth thoracic spines. The subjects complained of a sense of suffocation. Usually there was an increased reaction time, increased flow of saliva, and dilated pupils, never unequal.

(3) *Clinic Records.* Insomnia (4); tonsillitis (2); brachial neuritis (2); pharyngitis; asthma; eye disorders (not refractive) (2); bronchitis (4); influenza (2); melancholia.

SECOND THORACIC

(1) *Animal Tests.* Dilatation of the vessels of the upper lobes of the lungs was always noted. There were irregular pulse and respirations. and sometimes dilatation of the cranial vessels.

(2) *Human Tests.* The average reaction time was increased from .43 sec. to 1. sec. The pulse became irregular, and the respirations shallow and rapid, and the subjects complained of a sense of dullness and of a discomfort of a vague nature, variously described.

(3) *Clinic Records.* Brachial neuritis; bronchitis; successive attacks of pneumonia; : conjunctivitis; cardiac asthma (without valvular lesion).

THIRD THORACIC

Animal and human tests are not to be distinguished from those described for the second thoracic.

Clinic Records. Chronic rhinitis, successive attacks of pneumonia and of influenza.

FOURTH THORACIC

(1) *Animal Tests.* Lesions of the fourth thoracic were followed by dilatation of all the vessels of the lungs, decreased pulse rate, and increased respiratory rate. Sometimes there were increased gastric movements.

(2) *Human Tests.* Lesions of the fourth thoracic vertebra were followed by decreased rate or force of the pulse, increased depth and frequency of the respiratory movements, lowered blood pressure, and increased reaction time. The subjects complained of feelings of sleepiness and of a sense of suffocation. There were sometimes pain in the arms and shoulders and dilatation of vessels of the hands.

(3) *Clinic Records.* Hysterical spasm of the oesophagus: gastritis, bronchitis; brachial neuritis; cardiac neuroses (2).

FIFTH, SIXTH AND SEVENTH THORACIC

These may be described together, since the effects were not to be distinguished under the conditions of our tests, nor in the clinic records.

(1) *Animal Tests.* Lesions of these vertebrae, or of any one of them were followed by dilatation of the vessels of the entire lungs, or of the lower lobes only. The blood vessels of the stomach were dilated.

(2) *Human Tests.* Lesions of these vertebrae were followed by lowered blood pressure and a slower pulse. The reaction time was increased from .52 sec. to .9 sec. The subjects complained of feeling sleepy and dull. Sometimes there was a slight nausea, and a noise of gas moving in the stomach and intestines.

(3) *Clinic Records.* Pleurisy; nervous dyspepsia; influenza; gastritis (2); melancholia; pulmonary and laryngeal tuberculosis; headache, acute rhinitis; pseudo-angina pectoris.

EIGHTH THORACIC

(1) *Animal Tests.* Lesion of the eighth thoracic vertebra was followed by dilatation of the vessels of the lower lobes of the lungs, by dilatation of the stomach and its vessels, by decreased peristalsis of the stomach and intestines, and sometimes by increased size of the spleen.

(2) *Human Tests.* The effects of this lesion upon human subjects were as follows: lowered blood pressure, decreased pulse rate, usually noise of

moving gas in stomach or intestines usually sense of sleepiness. The reaction time was increased by an average of .5 sec.

(3) *Clinic Records.* Bronchitis; pleurisy; gastrectasis; gastritis (3); bradycardia; nervous dyspepsia; cholelithiasis.

NINTH AND TENTH THORACIC

(1) *Animal Tests.* Lesions of these vertebrae were followed by the following conditions: lessened peristalsis in stomach and intestines, dilatation of the vessels of stomach, intestines and pancreas, increased size of spleen, accumulation of gas in intestines and within the omentum, and sometimes reversed peristalsis. In some cases the gas could be seen as it accumulated upon the surface of the omentum and mesentery.

(2) *Human Tests.* Lesions of these vertebrae produced, in the human subjects, lowered blood pressure, increased reaction time, noises of moving gas, and a sense of sleepiness. Sometimes the gas accumulation caused some discomfort but no sense of nervousness or headache or malaise appeared in the human subjects during the tests, though these discomforts were invariably present in lesions of the upper thoracic and cervical vertebrae.

(3) *Clinic Records.* Colitis; gastrectasis (2); gastritis (3); pneumonia; splenitis; hepatitis; catarrhal jaundice (2); hepatic cirrhosis; constipation (7).

ELEVENTH AND TWELFTH THORACIC

(1) *Animal Tests.* These include also the effects of the thirteenth and fourteenth thoracic vertebrae. The effects produced in animals by lesions of these vertebrae included dilatation of the blood vessels of the intestines, kidneys, supra-renals, ovaries, testes, and sometimes the bladder. There were also lessened peristalsis of the small intestines with accumulation of gas, as before noted, and sometimes a persistence of the circular contractions in the small intestines. Dilatation of the blood vessels of the caecum and appendix were also present.

(2) *Human Tests.* Lesion of the eleventh and twelfth thoracic vertebrae were followed by a weakened pulse, greatly lowered blood pressure, sometimes as much as 30mm of mercury, oftener 10mm or so; by increased

reaction time, by lessened power of attention, and by sleepiness. Sometimes there were noises of moving gas.

(3) *Clinic Records.* Lumbago (2); haemorrhoids (3); constipation (9); appendicitis (3); sciatica (3); nephritis (3); dilatation of the stomach and colon; rheumatoid arthritis; enuresis; cystitis; ovaritis; dysmenorrhoea (3).

FIRST AND SECOND LUMBAR

(1) *Animal Tests.* In animals, lesions of these vertebrae produced lessened peristalsis in both large and small intestines. There was noted also dilatation of the vessels in the intestines, kidneys, bladder, ovaries, testes, uterus (pregnant), and the supra-renals. Gas accumulated in the intestines, the spleen was increased in size. The production of the lesion sometimes initiated the contractions of the pregnant uterus. In other cases the contractions were lessened and sometimes stopped when the lesions were produced after the contractions had begun.

(3) *Clinic Records.* Constipation (7); dysmenorrhoea (5); sciatica (3); lumbago (2); asthma; appendicitis; haemorrhoids (2); habitual abortion.

THIRD, FOURTH AND FIFTH LUMBAR

(1) *Animal Tests.* These lesions produced dilatation of the blood vessels of the colon, bladder, and all reproductive organs. This reaction is usually lost upon section of the spinal cord at the level of the second lumbar spine. There were lessened peristalsis, more noticeable in the colon, accumulation of gas in intestines. There was often reversed peristalsis in the colon and sometimes in the small intestines.

(3) *Clinic Records.* Haemorrhoids; constipation (3); dysmenorrhoea (2); enuresis (3); lumbago (3); sciatica (2).

INNOMINATE

(1) *Animal Tests.* These were very unsatisfactory. There were some dilatation of blood vessels and some changes in function noted, especially involving the external reproductive organs and the rectum and bladder. These reactions were extremely variable in different animals. The white rat gave most pronounced results. No tests were made upon human subjects.

(2) *Clinic Records.* Haemorrhoids (4); cystitis (2); urethritis; dysmenorrhoea (6); constipation (5); sciatica (6); lumbago (3).

DIAGNOSIS AND TREATMENT OF THE LOWER DORSAL SPINE

T. E. HALL AND P. A. JACKSON

The subject of our demonstration is the diagnosis and treatment of lesions of the lower dorsal spine, but some introduction is necessary in the form of a short general discussion of the area from the viewpoint of physiological movements, lesion tendencies and symptomatology in terms of the nerve connections of the area.

First a definition. We have included in the lower dorsal area all segments from D5-D12 inclusive. We have done so because this corresponds to the so-called splanchnic area, associated with the greater, lesser and least splanchnic nerves, in spite of the fact that it includes two thirds of the dorsal area. And it must be stressed that from the point of view of the physiological movements of the spine this is a purely arbitrary grouping, since these movements are by no means constant throughout the area.

The chief movements in the thoracic spine are flexion and extension, but even these are strictly limited in the upper segments, and only become free in the lower three. Flexion is the less restricted of the two movements, since the angle of the facets and the separation of the ribs posteriorly aid flexion more than extension. In the lower three segments both movements are relatively free.

The compound movements of extension-rotation-sidebending and flexion-sidebending-rotation are again limited in the upper segments by the approximation of the ribs. In extension, any degree of sidebending must be preceded by rotation to carry the upper ribs posteriorly to avoid locking and impingement on the lower ribs. In easy normal, or flexion, sidebending is followed by rotation to the convexity in the manner which is familiar in the production of scoliosis. In the lower segments both these compound movements are free, with the sidebending component predominating.

The extreme lower limit of our area, the dorso-lumbar junction, is a transition area, in which the angle of the facets changes abruptly from the coronal plane of the dorsal area to the sagittal plane of the lumbar. The type of movement permitted between the 11th and 12th dorsal vertebrae and that permitted between the 12th dorsal and 1st lumbar is different, and the possibility of lesioning at this level is correspondingly increased.

Rib movements are of two main kinds, the so-called bucket-handle and pump handle movements. In the former the axis of motion is a line drawn from the costo-sternal articulation to a point between the costo-transverse and costo-vertebral articulation; and movement of a rib about this axis raises or lowers the shaft of the rib, and increases or decreases the transverse diameter of the thorax. In the pump handle movement the axis is drawn between the costo transverse and costo vertebral articulation and the neck of the rib rotates on its long axis, thus raising or lowering the sternal end of the rib and increasing or decreasing the anterior posterior diameter of the thorax. These two movements are normally combined in a compound movement containing both components. In the lower two floating ribs this does not apply since the anterior ends are free, and movement here, although slight, takes place in all directions, and is termed enarthrodial.

The nerve connections of the lower dorsal area include the greater, lesser and least splanchnic nerves which supply the intestinal tract from the stomach to the transverse colon, the liver, pancreas, kidneys and adrenals, and most of the structures of the uro-genital system. These are the pre and post ganglionic fibres of the sympathetic system, travelling via the coeliac and superior mesenteric ganglia.

In addition there are the intercostal nerves supplying the segmentally related somatic structures, and carrying also the vaso-motor, pilo-motor and sudo-motor nerves. Finally there is the nerve supply to the diaphragm coming partly from the phrenics and partly from the lower six intercostals, the pleural and peritoneal covering being supplied by the vagus and sympathetics.

The importance of a properly functioning diaphragm can hardly be overestimated, and its influence upon the thoracic and abdominal viscera is profound. The splanchnic nerves and the ganglionated chain pass through the crura of the diaphragm and the coeliac ganglia lie on the surface of the crura. The integrity of the lower dorsal spine and ribs is thus seen to be of great importance in the functioning of the diaphragm and through the latter in the functioning of neurologically related viscera.

Diagnosis and correction of lesions in the lower dorsal can hardly be reviewed without reference to changes taking place in areas above (mid and upper dorsal) and below (lumbar, lumbo-sacral and pelvis) and especially at the dorso lumbar, where the changeover from coronal to sagittal facets in the 12th dorsal-1st lumbar poses its own particular problem.

This lower dorsal region accommodates itself very easily to strain in any other part of the body, particularly to postural imbalance and pelvic torsional imbalance. The transitional nature of this area must be involved in the strain of maintaining the erect position, especially in a compensating manner following such conditions as primary short leg, errors in locomotion, psoas muscle contracture and even the simple individual ilial lesions. The muscles of the back also play an important part in any disturbance of this area exclusive of the erector spinae group, e.g. the latissimus dorsi arising from the crest of the ilium on its way to the upper extremity has attachments separately to the lower three ribs. The quadratus lumborum, short and powerful, from pelvis to 12th rib, represents tension strain in any lateral deviation of this area. In any review of this lower dorsal area, the last six ribs must be taken into consideration as apart from the costo-vertebral and costo-chondral articulations, we must recollect the crura of the diaphragm and its attachments to these six lower ribs as well as to the upper lumbar vertebrae.

Individual lesions certainly do occur in this region but in our experience mainly have to be sorted out from within some compensating curve which is either exaggerating a normal kyphosis or a lateral curve shifted from the mid line of the spine.

These single lesions found here seem to exercise a lot more influence in disturbance of reflexes and of visceral functions than in other parts of the body; no doubt the lumbar enlargement of the spinal cord which commences at the 10th dorsal could account for the variations in vaso motor control and pain referred to areas remote from this lesioned region.

Diagnosis in this area should follow the pattern for diagnosis in any other part of the spine—viz. Visualisation—Palpation—Mobilisation tests. This area pays dividends when *visualised* in the standing position, trunk flexion and extension, and sitting and prone positions. Flexion and extension lesions practically stand out on their own, singly or collectively, and gross rotations are obvious. This should be followed by *light palpation* to determine changes in temperature painful or tender spots, deviation, gross or otherwise, of the spinous processes, tension of surrounding tissues, muscles and ligaments. Spasm in muscle is usually to be found on the side of vertebral rotation with tenderness to pressure; deep tenderness is more often located on the side to which the spinous process has moved. In the tests for *mobility*, one should bear in mind that movement in the direction of correction elicits more pain or resistance than movement in the direction

of exaggeration; deep mobilisation pressure gradually applied with the patient in any position will also indicate the particular inter-segmental articulations involved. We should also remark here that the physiological movements of the spine as described by Fryette should be strictly interpreted in dealing with this particular area. Leverages applied for diagnosis in this area are legion but it should be obvious that the ones that can be applied while leaving the hand or hands free for the delicate interpretation of tissue findings and mobility changes should be chosen, where possible.

A point we think is insufficiently stressed in this area in relation to the art of technique, is the application of the Body Triangle. This triangle is represented by the operator's two arms with elbows flexed, and his body as the base of the triangle. The area under treatment is contained triangle the triangle and the rule is: That all angles of the Triangle should be approximated toward the centre, as represented by the lesioned area to reduce the risk of strain to the patient and to the operator. The operator's body posture should be accommodated to the triangle throughout the execution of all techniques used in correction. We shall hope to illustrate the use of this Body Triangle technique in relation to the techniques which will be demonstrated to you today.

THE OSTEOPATHIC TREATMENT OF DISEASES OF RESPIRATION

STAFF LECTURE

The pathological changes that take place in diseases of the respiratory tract may be obstructive in nature and produce two forms of mechanical symptoms.

1. *Dyspnoea* – produced by obstruction of the bronchial tubes or blood vessels, as in asthma, bronchiolitis, etc.
2. *Cyanosis* – an interference with the interchange between blood and air.

These conditions are caused by modified activity of the muscles of respiration in respect of their function and reaction, and of the nerve system controlling respiration. Any factor which affects these nerves may interfere with respiratory muscle action or with the muscular structure in the walls of the bronchii causing e.g. bronchial spasm. There are three main ways in which these interruptions may occur:

1. Interference by pressure involving a particular nerve, e.g. the 10th cranial nerve or some of the spinal nerves from 4–7T may be affected by aneurism or muscle or bone lesions.
2. Central interference caused by accumulation of urea, uric acid, phosphoric acid, affecting the action of the automatic centres, or interfering with the action of the higher centres upon the automatic centres, as found in encephalitis or hysteria.
3. Reflex interference with the 10th cranial nerve by sensory stimulus from a viscus, such as stomach or liver. In this case, the irritation is distributed via the autonomic nerves, whereas in the other cases the irritation is through the spinal nerves.

Diseases of the pleura often affect the respiratory apparatus. The primary inflammation may occur with exudate which reduces the thoracic capacity and so its respiratory ability, or without exudate when there is inhibition of movement and reduced expansion of the thorax and lungs due to pain.

Respiratory changes are sometimes due to changes in the heart or other parts of the circulatory system. The heart and lungs are closely related through the pulmonary plexus via 4–7T which is the accessory visceromotor centre in relation to both heart and lungs. In addition, equilibrium

between the systemic and pulmonary circulations is delicately balanced, so that a change in the systemic circulation materially affects the lungs. This is particularly so because the lung circuit is short, leaving little room for compensatory action, this affect being still greater in the case of chronic lung disease. Different processes in the body depend so largely on the supply of oxygen furnished by the lungs, that any condition of imperfect nutrition found anywhere in the body interferes by reaction on lung activity and may so influence lung disease. Hence there is established a close relation between the lungs as viscera and the blood system so that the lungs are liable to be affected by infectious or toxic disease in other organs of the body.

THE GENERAL RESPIRATORY DISEASES

Subjective symptoms The central point in respiration is that we breathe to live, respiration being the foundation of vitality. Therefore, the subjective symptomatology is the expression of modified reaction of the respiratory system in relation to an attempt to change breathing function because of some abnormal condition elsewhere in the body.

Dyspnoea is a deeper and more frequent respiration than normal. In some of the lung diseases there is no dyspnoea because the change is sufficiently gradual for the lung to accommodate itself. It is generally produced by factors which lessen or cut off the normal amount of air, or from a diminution of normal space in the lungs.

Cough is a reflex action caused by irritation of the mucous membrane lining the air passages, or sometimes by pressure of a foreign body in the meatus of the ear or irritation from teeth, stomach or liver. A dry cough occurs when the source of irritation cannot be removed at once; the moist cough is produced when there is a temporary irritative factor in the air passages which can be removed by forceful expiration. The rough cough which is neither moist nor dry may be the result of bronchial obstruction or of abnormal peristalsis in the air passages.

Haemorrhage occurs through rupture or weakening of the cells in the air passages.

Pain occurs chiefly in the pleuritic types of respiratory disease and in bronchitis, when it accompanies the cough with a dull substernal soreness. In pleurisy pain is felt before exudation takes place and is felt following the rub path round the thorax.

Acute Bronchitis. This is a catarrhal inflammation of the mucous membrane lining of the large and medium sized bronchi. It may occur as a result of the inhalation of an irritant in the form of vapour or dust, from the spread of infection from the upper respiratory tract, or more rarely, by blood-borne infection. The first stage of the disease is hyper-physiological and the control of the mucous and sub-mucous tissues remains under the vaso-motor system, but under the influence of the rise in temperature or of the temperature centres control passes to the secreto-motor function. Note that secreto-motor function is not controlled from the medulla as is vaso-motion, but operates as a sympathetic function; which means that the catarrhal sequel to bronchitis is under sympathetic not central, control. This explains why there is always a tendency to chronic catarrh in children and old people, in whom sympathetic function tends to be prominent. The primary stage passes within a day or two when there is congestion, oedema and leucocytic infiltration of the mucous membrane followed by the secondary stage of hyper-secretion of mucous mixed with pus and desquamated cells.

Bronchitis usually begins with a cold. It is accompanied by a hard dry cough without expectoration which becomes moist with white mucous accumulation and later pus cells and broken-down epithelium. At this stage the bronchitis is fully established and there is a feeling of tightness, rawness and weight around the upper sternum. There is a slight increase in temperature and in respiration rate. Chest pain is myalgic and due to pressure, strain or irritation of the muscles from abnormal respiration or coughing. Bronchial diseases are not so severe as pulmonary diseases; in differentiating these it may be noted that bronchial diseases are bilateral except those due to obstruction by foreign bodies; the bases of the lungs are most commonly affected; there is rarely dullness, and there is always some type of rale due to disturbance caused by the obstructive nature of the bronchitis.

General treatment. Here one has to deal with a congestion and hyperaemia in the entire respiratory field. The blood supply to the respiratory apparatus is copious and complicated so that congestion is readily produced and difficult to deal with. Palliative treatment must be through the 10th cranial and curative treatment through the sympathetics. The 10th cranial nerve may be affected through the occipito-atlantal joint via its central origin on the floor of the 4th ventricle and along the path of the carotid artery, in the case of bronchitis especially just above the clavicle.

Gentle inhibition is directed at these points because these are regulative in the action of respiration and are affected by pressure or over-stimulation at these points. The sympathetic supply to the affected area is reached via 3, 4 & 5T, the latter being the centre of cough in connection with the respiratory apparatus. (The general cough reflex is centred at 3T; the sensory type of cough is centred at the spinal connection of the laryngeal and pharyngeal branches of 10th cranial at 4 & 5C; the centre of cough at 8T is via the solar plexus where the irritating cause may be in the abdominal viscera). Contractured muscles which obstruct the circulation by producing congestion and also pressure on the nerves which control the lungs and bronchi should be relieved early in the treatment, this applies especially when the cough is paroxysmal. Relief may be obtained in the early stages by inhibition at 5T and by relaxing muscles in the region 5C to 10T, particularly in the region 2-7T which is related to bronchial vaso-motor disturbance. At a later stage the anterior muscles are affected and are often found in a state of absolute rigidity in the late stages of bronchitis. In some cases this contraction is sufficiently severe as to cause subluxations of the ribs and vertebrae. This may produce a tendency to chronic bronchitis, so that during the acute stage it is necessary that the muscle contraction in the thorax and spine from 2-7T, and that the ribs and vertebrae are corrected and freely articulated.

SPECIFIC TREATMENT

With the patient seated on a stool, place the knee between the scapulae and raise the patient's arms above the head as high as possible. As the patient breathes deeper, draw the arms slowly downwards and backwards while pressing strongly with the knee, repeating four or five times. This is designed to relax the muscles generally and to free the circulation of air and blood through the bronchi and lungs. With the patient on his back, clasp the fingers behind his neck, covering the area 1 to 3C and press firmly between the spinous processes. At the same time lift the patient's neck forward and upwards, allowing the neck to return to the level position. Repeat several times. Give careful rotation to the head and neck followed by extension, with firm pressure behind the mastoid processes with the fingers while the patient slowly opens the mouth. Then vibrate and press tightly with the fingers on the forehead above the eyes and along the sides of the nose: manipulate the muscles of the face to the neck, the patient breathing freely all the time. This frees the blood supply and affects the

10th cranial nerve via the facial nerve and muscles. Then manipulate the anterior muscles of the neck upward beginning just above the clavicle, and move the trachea upward towards the back of the mouth with vibration; if any rigidity is present move the head at the same time. Vaso-motor treatment is given in the neck in a downwards direction; this is rhythmic in character and consists of tight pressure over the sympathetic ganglia as the patient inspires, followed by stimulation as the patient expires. This is continued for three minutes to control and reduce the temperature and to produce an equilibrium in the arterial and venous blood circulations. Relax the muscles along the spine from above down by inhibition and articulate the vertebrae 1-7T. Repeat with the anterior muscles and the corresponding ribs. The ribs are raised and spread using arm leverage and treating upwards from rib 9. This will have an effect on the bronchi by freeing the blood circulation in the upper intercostal and azygos veins, and the nerve supply to the anterior and posterior pulmonary plexuses.

The object of this type of treatment is to stir up and co-ordinate blood and nerve activity in the thorax, and thus use the mobility generated by this co-ordinated movement to eliminate stasis in the bronchial field. Vibrate with the hands over the upper anterior thorax as the patient is breathing deeply to expand the lungs and pleura. Make the patient go to bed in a room with an evenly balanced temperature with plenty of fresh air. Stimulate the circulation with warm baths and keep uniform circulation with a foot warmer.

Bronchiolitis occurs as a complication of acute bronchitis when the inflammatory process spreads from the larger tubes into the bronchioles. The smaller tubes are readily obstructed by oedema and secretions and the situation immediately becomes more serious. There is marked dyspnoea and tachycardia; the face becomes cyanosed. Exhaustion occurs and there may be mental disturbance, delirium and coma. The intercostal spaces fall in during inspiration: there is widespread emphysema: breath sounds are reduced and rales may be heard over the affected area of the lungs.

Treatment is similar to that of acute bronchitis. Give as little fluid as possible during the acute stages until the static condition of the internal fluid is relieved and then give as much fluid as the patient can take. Give concentrated pre-digested food. Raise the clavicles to stimulate lymphatic and venous circulations and make sure that all the structures round are thoroughly loosened. Vibrate over the upper sternum and over the path of the jugular veins to make the return flow to the heart as easy as possible.

Then with the patient on the back and one hand pressing upward against the spine, raise the arm gently above the head and give light vibratory movements as the arm is brought down alongside the body; this should be applied to the area from 7C to 8T. The object is to relieve intercostal tension and to expand the chest, lungs and bronchioles. The usual treatment for rib raising with arm leverage may be used if considered necessary. General treatment should be given to the vaso-motor area of the spine, especially to the pulmonary vaso-motor area at 2-7T. It is of interest to note that general vaso-motion is not weak in bronchitis, but exaggerated function takes place in the section of the vaso-motor system which originates in the spine in the area 2-7T, and it is this segmental disturbance which causes the bronchial congestion.

SUMMARY OF TREATMENT OF ACUTE BRONCHITIS

1. Parasympathetic inhibition: this is achieved by gentle inhibitory pressure in the area sub-occiput to 3C, manipulation of the facial and supra-clavicular tissues.
2. Sympathetic balance: alternate pressure (inhibition) and stimulation of the sympathetic cervical ganglia timed with inspiration and expiration. Inhibition of the spinal area 2-7T to balance local vaso-motion.
3. Mechanical and circulatory. Articulation and soft tissue treatment to thorax.

CHRONIC BRONCHITIS

This condition is found chiefly in middle and later life and occasionally encountered in the young. Most commonly the chronic state is secondary to the acute, or to recurrent attacks of acute bronchitis, but may also occur secondarily to chronic heart, lung or kidney disease especially if of a toxic order. Predisposition may occur as a result of some structural defect with diminished mobility, such as emphysema or spinal curvature, producing stagnation of bronchial secretion and weakened resistance to infection. Oral or pharyngeal sepsis may result in secondary bronchial infection.

Following the pathology of the acute type, the mucous membrane becomes thinned and the epithelium atrophies, thus the longitudinal elastic fibres are exposed, and the muscular layers and the glands atrophy. In some cases the mucous membrane becomes thickened by granular infiltration, this being the result of a low grade nutritive condition. The condition

develops slowly and is usually of long standing. It often follows several attacks of acute bronchitis occurring annually during the cold season and which continue longer and longer into the summer until it lasts the year round.

Symptoms. Dyspnoea made more evident by exertion is the most common subjective symptom. This is due to blockage of the bronchii by excessive secretion and to the emphysematous condition of the alveoli. There is tightness round the chest and soreness under the sternum; the chest is distended. The percussion note is clear and often hyper-resonant, particularly if emphysema is present. Respiration is harsh, high in pitch and showing signs of dilatation, snorting breathing, long expiration and moist wheezing rales. There are three types of chronic respiratory murmurs associated with bronchial conditions: first, due to excessive secretion from the bronchial glands which may be either limpid or mucoid. Second, the putrid or fetid type in which there is sloughing of the glands, sometimes accompanying dilatation of the tubes with chronic pneumonia, pthisis and pyaemia. Thirdly, the plastic or fibrous type. There is lack of bronchial movement and fibrinous matter accumulates and is thrown off as a mould sometimes with haemorrhage. Under water the mould is seen to consist of small solid casts of a bronchus, formed of solidified mucin.

Treatment. This differs from the treatment of the acute case in that attention is directed to the osseo-ligamentous type of lesion and at longer intervals. To relieve obstruction and venous stasis carefully relax the soft tissues of the throat and the upper part of the chest. Loosen the muscles with vibration, which also prepares the nerves for treatment and to enhance the rhythmic effect in the tissues generally. The nerves distributed peripherally along the minute bronchioles are in a state of paralysis due to pressure exerted by muscular rigidity and venous accumulation. To deal with these conditions relax the muscles in the lower neck by raising the clavicles, vibrate over the jugular veins, and inhibit over the phrenic nerves on both sides. Relieve the upper part of the diaphragm and stimulate the lower part by pulling upwards and laterally outwards to prevent fixation of the diaphragm by the reaction of its two sections. (This treatment directed to the ribs). Then lever the arm above the patient's head with one hand on the spine to treat the muscles, and follow up by placing one hand between the scapulae and push up and allow to drop as the patient inspires and expires.

Lesions are important from 1-7T, especially of the lateral type, and of the ribs. These should be corrected to relieve the inflammatory condition of the bronchial tubes. Dilation of the bronchial tubes means that some obstruction to the motor nerves is present, the function of which may be reached by articulating from 1-5T downwards, using push and pull movements to the spinous processes in order to relieve the anterior roots of the spinal nerves. The 10th cranial nerve supplies the motor nerves to the transverse muscles of the bronchial tubes, so that stimulation should be given by gently rotating the head and atlas together, followed by light pressure along the posterior carotid sheath.

The digestive system should be kept active, especially the glands of the stomach and the secretion of the liver and kidneys. Treat the superficial circulation, then the organ, and give strong stimulation to the solar plexus. Sometimes there is a lesion between the manubrium and gladiolus, the upper part of the sternum becoming locked and rigid. In some cases there is a bulging at the articulation which causes interference with free thoracic movement. In correction attempt to lower the second rib slightly by placing one finger between the 1st and 2nd ribs anteriorly, with the patient on the back, and lower the arm down and back; then with the flat of the hand on the upper part of the sternum apply strong pressure and pull the arm up and out from the body. Stimulate the thorax rhythmically through the action of the muscles of respiration while the patient breathes deeply, and appeal to the rhythmic activity of the thorax as a unit through the thoracic play movement.

The patient should have nutritious food in small quantities, easily digestible and a minimum of carbohydrates. All stimulating elements should be eliminated to reduce stimulus of the larynx and oesophagus. Frequent warm baths, gradually changing to cold, and as much open air exercise as possible, but avoiding wind.

In the fibrinous or plastic type, we have the destructive vaso-motor type of chronic bronchitis which is either direct, or from a reflex cause, producing capillary congestion at a particular point in the bronchial system and at a particular stage in the bronchitis. The nett result is a sero-fibrinous exudation at one point in the bronchial tree causing deposits. Therefore, the primary is vaso-dilation, or the inhibition of constriction in relation to vaso-motor function in the bronchioles. This vaso-motor disturbance is caused by subluxations of 2-5T and ribs, and intense contractions of muscles in the upper C and upper T spine.

Treatment. Light inhibition in the vaso-motor area in the upper C to regain control of vaso-tonicity via the medulla and over visceromotion via the sympathetic cervical ganglia. The inhibition is repeated every few seconds for 3–5 minutes, the idea being to regulate the heart action and establish capillary and arterial co-ordination. Give special attention to the large veins and lymphatics, the latter along the neck and upper thorax, and particularly in the axillary area, using arm; leverage gently but strongly above the patient's head while applying moving pressure over the neck, continuing into the lower neck if the muscles are contracted there, but with outward rotation of the arm. Elevate the clavicle at its sternal articulation with the fingers and give moving pressure at the heads of ribs 1 and 2 using the same arm leverage. Apply vibration to the glands and muscles in front of and along the sides of the neck, especially along the carotid and jugular sheath, affecting 10th cranial and phrenic nerves. Direct treatment to the inferior laryngeal nerve at the inner side of the lower part of the sternomastoid muscles. Hacking treatment over the centre of the clavicle to stimulate the lymphatics in relation to the lymphatic ducts. Pull up the trachea from its lower border and give shaking movements while tipping the head back slightly. Then grip and pull the tongue manipulating the mucous membrane of the mouth with the finger from the tip of the root of the tongue: then with the mouth closed give light inhibition to the muscles at the articulation of the lower jaw. The diet and hygiene is similar to that given in chronic bronchitis except that fluid is restricted and the food as dry as possible. The patient should masticate freely and the amount of active exercise should be limited.

LOBAR PNEUMONIA

This is an inflammatory condition of the lung associated with the presence of pneumococcus, streptococcus or staphylococcus in the affected area. It occurs most frequently in early life and becomes more frequent again increasing after the age of thirty. In childhood, the sexes are affected equally, but in adults males are more commonly affected. It generally follows upon a condition which impairs the resistance of the body to disease, e.g. exhaustion, exposure, influenza, chronic disease or old age.

PATHOLOGY

There are four stages:

1. *Congestion or vaso-motor disturbance or unbalance causing pulmonary stasis.* The lung substance becomes bathed in blood and serum which engorges the capillaries, while the alveolar cells are filled with frothy fluid containing dead white and red corpuscles.

2. *Red hepatisation, the lung resembling liver in appearance and texture.* The lobe becomes enlarged by pressure, the alveoli become filled with fluid which solidifies into a fibrinous mass containing many blood cells.

3. *Grey hepatisation.* The lung tissue is dense with yellow exudate on the surface causing the grey colour. The fibrinous mass in the air cells is infiltrated with leucocytes.

4. *Resolution.* The eliminative processes gradually clear the condition with possible extension of the disease process to other organs.

SYMPTOMS

The onset is very sudden with high temperature which terminates by crisis or lysis in about a week. There may be pain from an accompanying pleurisy: there is a painful cough with sputum which is mucoid at first later becoming blood stained. The face is flushed, skin dry and tongue coated; herpes may appear on the lip. Breathing is rapid, there is a full hard pulse, headache and sleeplessness.

Treatment. This is a blood disease with a tendency to transfer the disease to the lymphatic field, i.e. there is a functional reaction to obstructive pathology. The disturbance of circulation is due to:-

1. Derangement of the vaso-motor apparatus involving lesion in the vaso-motor areas on the right side of the spine 1-5T, the 1st thoracic being involved because of the lymphatic disturbance. Pneumonia is not a primary lung disease, but settles in the lung because the toxic condition is transferred from some other field. Influenza develops into pneumonia because the toxin is not secreted, but must be eliminated by combustion, hence it goes into the lung to be oxidised.

2. Separation of the blood into fluid and solid from the unbalance between blood and lymph as fluids. This is a catarrhal effect, i.e. due to chronic vaso-dilation, hence catarrhal subjects are liable to pneumonia. The mucoid infiltration is a result of this effect which the lung is unable to absorb, the physical process of resorption interferes with the physiological

condition of the lung. Hence the presence of bloody serum-like exudate in the lung tissue; if there is nothing more than a simple congestion of the lungs there will be no pneumonia.

In the early treatment of the pneumonic condition therefore:

1. Try to abort it or prevent it from becoming established by affecting the vasomotor side of blood circulation, remembering that in pneumonia there is excessive vasodilation. Treat by inhibition in the cervical and upper thoracic spine followed by lesion adjustment and strong stimulation of the muscles in these areas. This assists co-ordination of the cerebro-spinal and sympathetic nervous systems.

2. In the establishment of the pneumonic condition, the first marked functional change is a respiratory derangement due to obstruction of the circulation resulting from inco-ordination between C.N.S. and sympathetic nervous system and causing neurosis of the lung, following which congestion takes place, thus establishing the pneumonic condition. Therefore treatment should be generally vaso-constrictor, 2L-2D upwards and with this, vaso-dilator treatment for the bronchii and lungs, 6C-3T.

3. In the second stage of the development of pneumonia there is a physical reaction to modified respiration, i.e. loss of chest movement with immobility on the affected side. Treat to increase the movement of the chest and ribs, and put the patient on the other side. Articulation of the ribs and vertebrae on the immobile side should be given periodically up to every fifteen minutes. Do not allow the patient to lie on the back, but on the side opposite the involved lung. Start the chest movement by articulating rib 3, moving it downwards while applying upward pressure at the angle of the rib during expiration. In average cases do not use arm leverage, particularly in the early stages.

4. As the right side of the heart is doing extra work, cardiac stimulation leads to weakness and possibly shock. Examine for lesions at 2-5T right, and treat at this stage only by gentle inhibition.

5. Stimulate the abdominal region through the middle and lower T, the lumbar and sacral spine, rhythmically, following the correction of irritative lesions.

6. Treat the nerves that control the capillaries through the vaso-motor pulmonary system by stimulation of 1-7T, also give strong vibration over the anterior thorax, especially attending to ribs 4 and 5 on the affected side.

7. Attend to correction of muscular and osseous lesions in lower C and from 2-7T to balance lymph and blood supplies. Articulate in those areas whether there are lesions or not, and also vibrate over the scapula and interscapular areas.

8. Keep the mid and lower C regions relaxed. Here there is an important motor and inhibitory centre in relation to the lungs via the 10th cranial and sympathetic nerves. The aim is to cause inhibition of local vaso-motion and general dilatation of peripheral blood vessels. This will also assist the lymphatics in the lower neck and helps to relieve the cough by relaxing the tissues around the upper trachea and larynx.

9. Treat the 10th cranial nerve, especially the superior laryngeal branches by soft tissue treatment high in the C spine and along the trachea.

10. The recurrent laryngeal nerve is sometimes irritated; treat by aortic dilatation, i.e. by raising thorax as a whole, and by relieving sub-clavian congestion by raising the first two ribs (not using arm leverage) and relaxing the local musculature, including the sterno-mastoid muscles.

11. To co-ordinate respiration and heart rate: raise the ribs 2-5 on affected side without use of arm leverage, and articulate the corresponding vertebrae by push and pull methods.

12. Try to radiate heat away from the body by physical means. Cold sponging causes by reaction a mild superficial dilatation and therefore relieves the lungs and stimulates the superficial circulation. Give treatment to the area 2-5T. 2-4T represents heart rhythm, and treatment should be rhythmic; 4-5T represents heart force and beat, superficial circulation and aortic pressure, hence treatment at 4-5T should be articulatory only.

13. *Diet.* No starch, sugar or fat. Give liquid albuminous food, e.g. dry peptones. Keep the patient in bed with the temperature uniform and do not allow to lie flat.

14. Cold packs should be applied between the shoulders and all over the lung surface area if the patient is not chilled. If so, use hot packs of linseed meal poultice, mild mustard or antiphlogistine jacket, but do not allow drying to take place. This causes elimination towards the surface of the body, therefore change frequently and sponge the skin afterwards. In very severe cases of congestion blistering may be useful by applying croton oil over the posterior chest wall. This brings the fluid towards the spine. Follow by hot sponging and dry the skin by mopping, not by rubbing.

THE FUNCTION OF THE DIAPHRAGM IN RESPIRATION

J. MARTIN LITTLEJOHN

The function of respiration depends almost entirely on the mechanical movements of the thorax, which are co-ordinated with the rhythmic activities of the internal organs under the regulative control of the diaphragm. The structural foundation centres in the nasal, pharyngeal, tracheal and bronchial passages, and the air vesicles. Under this heading certain points are to be emphasised. All the air passages are lined with ciliary epithelium which functions as a protective mechanism. In the trachea and bronchial tubes the structures are incompressible so that here the movement of air is a physical process. In the small bronchi the movement is balanced between muscle and cartilage; this secures the openness of the passage way and regulates the quantity of air to the air vesicles, under the control of visceromotor activity. The minute bronchioles all terminate in membranous sacs in the wall of which are located the terminal capillaries and arterioles of the pulmonary blood system. This places the alveolar sac at the terminus of the respiratory mechanism and brings every red blood corpuscle into direct contact with the free air in order that the haemoglobin can be perfectly oxygenated. This means that the alveolar sac figures more largely in blood oxygenation than any other part of the respiratory mechanism.

The lungs and each separate lung are covered over with a double layer of pleural membrane. The inner layer covers the lungs and represents the visceromotor functioning. The outer layer reflects all over the interior of the thoracic cavity with the pleural cavity intervening between the visceral layer (visceromotor) and the internal lining of the thorax (secretomotor) so as to provide a free space for the avoidance of pressure and trauma and to give room for lung elasticity. We should look upon lung elasticity as being centred in these two layers. They are separated also by the pleuritic lymphatic fluid in order to avoid dry friction in respiratory movements, so that in dealing with the friction sounds following some of the lung diseases we should use the secretomotor and lymphatic approach. (It is here too that we get air penetration in pneumo-thorax and the gas accumulation which is a feature when there is bacterial invasion of the pleura, and also the fluid and pus or pus and gas accumulations which we find in pyogenic thoracic conditions.) Sometimes, too, we get adhesions between the two layers and friction sounds as sequelae of certain chest and pulmonary

diseases. Mechanically the pleura separates the lungs from each other and from the mid line, leaving the interpleural and mediastinal spaces in which are situated the heart, the aorta and its branches, the pulmonary artery and veins, the ascending and descending venae cavae, the azygos veins, the thoracic duct, oesophagus and trachea, and lymph glands and vessels, all of which are to be treated thoracically from the mechanical side of secretomotion and the lymph.

The thorax as a mechanical cavity is formed by the thoracic walls plus the diaphragm which together make a cage in which the thoracic organs are suspended. Inspiratory action takes place by the enlargement of the cavity, expiratory action by its diminution. The normal size and position of the cavity, therefore, is that which is found at the close of normal expiration. In respiration the enlargement of the cavity normally takes place both laterally and antero-posteriorly. The rib elevation takes place by the action of the inspiratory muscles. Anteriorly the ribs rising involves action on the costal cartilages which bend and twist and in so doing become strained, the elasticity of these tissues tending to force the thorax back to its normal. The posterior attachment of the ribs to the vertebrae via the facets gives us an axis of rotation forwards and downwards.

Hence as the ribs move they rotate in a plane which is at right angles to the axis of rotation and this produces a rib movement which is both outward and upward and which determines the type and direction of thoracic movement. After the raising of the ribs by muscular contraction, the chest walls react, falling again by the elastic reaction of the costal cartilages plus the weight of the thorax. The diaphragm is attached to the lower ribs, the ensiform cartilage and the lumbar vertebrae which are the three mechanical traction points and tension points in diaphragmatic movement. When the diaphragm is at rest it extends up into the mid thoracic cavity where the mediastinal spaces are located. Under muscular contraction the diaphragm is pulled down from this position and it is this which produces an increase in the vertical diameter of the thorax. The diaphragm consists of muscle attached to a central tendon which is absolutely free except where it is attached to the pericardium, and so has freedom of movement.

When the vertical diameter of the thorax increases the peripheral part of the cavity is also increased by the flattening out of the diaphragmatic musculature. As the diaphragm is drawn down there is a decrease in the intra-thoracic pressure and the internal air force drives, not the air, but the

lungs downward against the diaphragm, and it is this which leads to more air being drawn into the lungs.

It should be noted that there is never a space between the lungs and the diaphragm in the normal thorax and it is therefore not suction, but pressure, which keeps the lungs in close contact with the interior of the thorax. This is the foundation of the thoracic pump treatment because this always affects the lymphatic fluid and tends to draw the blood towards the thorax or towards the abdomen according to whether it is given thoracically or abdominally. Another point to note is that when the diaphragm is lowered the abdominal pressure is increased with the result that the abdominal walls are forced outwards. Thus the real mechanism which keeps up the tone of the abdominal walls is not in the abdominal cavity but in the functional activity of the diaphragm. Lastly it should be noted that the serratus posterior inferior and quadratus lumborum muscles contract in order to prevent the lower ribs from being pulled upwards and forwards when the diaphragm contracts and causing a decrease in the size of the thorax; that is to say, these muscles control the transverse diameter of the thorax by an action balancing and opposing that of the diaphragm.

It should be remembered that the object of manipulation with reference to the diaphragm is to influence its action, from which definite results are to be expected. For example, we have sometimes to deal with a paralysed diaphragm which is not receiving proper stimulus from the respiratory centre. Ordinarily the diaphragm is capable of functioning automatically provided that the load it has to bear is not too great. The greatest load it has to bear is a resistant chest wall. This is the fundamental factor in practically all the acute and chronic respiratory diseases. The diaphragm, next to the heart, is the key to body vitality. In one sense it even stands above the heart because when all stimulants have failed, artificial respiration may be the last resort, and this is based on the stimulation of the respiratory centre through the activation of the diaphragm. If the respiratory centre fails or becomes burdened by the failure of the coordination centres in the medulla, then the diaphragm is the only means of stimulating vital activity in the respiratory centre. Hence, the first thing to be done is to release the thorax; no stimulus of any kind should be given to the diaphragm until this has been done. Next, if the diaphragm is fixed or limited by resistant parts these too must be released before the diaphragm is stimulated. We have to deal with the diaphragm itself, its attachments, the correlated chest wall, and especially the adjacent viscera in the mediastinal space. The main idea is to concentrate first on those

factors, such as the abdominal muscles, which tend to overload the diaphragm. In many cases spasm of the abdominal muscles is the chief cause of a paretic or paralytic diaphragm. Another factor is congestion or enlargement and distortion of the correlated viscera, particularly the spleen. abdominal aorta and thoracic duct. Another factor to be considered is abdominal ptosis. In dealing with this we should flex the legs and seek to lift the abdominal contents from the supra-pubic area. This will deal with the dropping of the organs, distention due to gas or fluid, and also the stasis of blood and lymph. At this stage we deal with the spinal thoracic centres D4-7 and the attachments of the diaphragm by attempting to spread it laterally. This can be done by gripping the costal cartilages of ribs eight to ten and pulling there laterally while applying lateral compression in the upper thorax with the elbows. Following this we should deal with fixations or approximations of vertebrae and ribs above eight.

Artificial respiration functions chiefly by the artificial operation of the terminal end of the diaphragm, the object being to stimulate suppressed respiratory activity. To do this successfully the patient should not be allowed to breathe freely because, if we attempt to make the lungs function through the air stimulus air absorption takes place and this opens the way for fluid resorption in the lungs and accessory fields with the result that there is an accumulation of fluid in the lungs which forbids the presence of air. The diaphragm is apt to be very slow to respond because of its inability to overcome the resistance of the chest walls. In attempting to overcome this resistance we should always do it from the lateral thorax rather than the anterior. The reason for this is that forcible movement of the whole chest from the front tends to cause an expansion against the posterior thoracic wall and thus inhibits both circulation and nerve action. The best movements are unit rib and vertebral movements and, as far as possible, unit muscle movements.

When these units combine flexibility of the thorax is the result and the reaction is always towards the respiratory centre. When the respiratory centre begins to show activity then the spine should be stimulated upwards from D8 and the terminal effect of this should be concentrated by strong and simultaneous stimulation of the three cervical ganglia, followed by arm leverage. At this stage the diaphragm should be free from all resistance in the chest wall, from muscle spasm and from congestion of viscera, gas distension and ptosis, with the final result that visceromotor effects originating in the splanchnic area will begin to stir up superficial muscle activity and organic activity. This should be supplemented by strong

articulation of the splanchnic area D6-12 downwards. Artificial respiration may then be supplemented by applying mechanical pressure suddenly at short intervals to the posterior chest wall. The object of this is to get at the unit ribs at their heads and thus stimulate and co-ordinate the spinal nerves in functioning chestward and spinalward and so encourage co-ordination between spinal centres and thoracic organs. Ribs four to seven are the ones to consider in this connection.

It should be noted that the central fixation of the diaphragm is the primary attachment through which nerve force is distributed to the thoracic cage and its contents and the abdominal aorta and the thoracic duct are the two structures which provide this central stimulus. In case of collapse of the thorax and the entire body trunk, the best stimulus is extension between head and neck and the feet which can be followed by stimulation of the abdominal aorta and by abdominal pump treatment provided that the thorax reacts to it. In connection with the peripheral attachments with their intra-fusal arrangement of fibres it should be noted that maximum chest function requires separation of the ribs. This can best be promoted at first by body elongation and at the same time pressing the fingers between ribs three and four and so on down to rib eight, repeating this until the ribs show their response by becoming elastic.

When thoracic mobility is impaired or destroyed the heart picks up the load and tends to become dilated, that is to say it is in trouble on account of the accumulation of venous blood on the auricular side. Therefore, if we are to deal with this heart embarrassment before getting rid of chest wall rigidity we must deal entirely with the venous blood. This contra-indicates vasomotor stimulation and indicates thorough relaxation, kneading and twisting of the abdomen followed by splanchnic stimulation from D8 to 12. The object is to pull the venous blood towards the abdomen, and to counteract this the abdominal pump treatment should be used to direct the lymph towards the thorax. In this way we get an exchange between thorax and abdomen, between venous blood and lymph, leaving arterial blood to be dealt with by flexion and rotation of legs and arms. This type of treatment also applies to cases in which the patient has collapsed with "gas balloon" stomach. In this condition there are obstructions to the movement of the diaphragm originating from changes in the size or mobility of the visceral organs.

The restoration of chest flexibility is essential in all the respiratory diseases, for the resistant chest wall not only hinders circulation and nerve

action but prevents the organs from functioning in balance with one another. Where the cavities of the body are concerned this last point is really the essential one in connection with the so-called acute diseases because in these diseases some viscus is not functioning in co-ordination with the other viscera in the cavity. Here the balance of pressure is disturbed and this causes malfunctioning of one or more of the organs: moreover, the change in pressure within the cavity prevents the normal functioning of the sensory stimulation to the spinal centres which control the visceromotion of the organs in the cavity.

In addition to everything else certain general treatment is called for. With the operator sitting at the bedside on a level with the bed the patient should be made to lie on his side with the side of the greatest contracture, distortion and restriction uppermost. The knees and thighs should then be flexed gradually from the right angle position while at the same time pressing towards the pelvis. This gives a degree of movement to the lower spine and pelvis in relation to the hips and upper limbs which stirs up circulation and increases nerve stimulation. Then one of the operator's hands should be placed under the lower side of the patient at the level of the upper thorax and the other hand over the upper side and compression applied between hand and hand, increasing it as the elasticity of the thorax increases. Then the palmar surface of the hands and fingers should be placed over the most constricted part of the thorax and the compression repeated, making the cushion part of the hand a resting place while the fingers operate the pressure. This places the restricted and contracted part of the chest in elastic antagonism to the freer part, and, if the treatment is continued until the entire thorax is covered, the elasticity of the ribs, intercostal muscles and accessory structures will be thoroughly established. During the whole of this procedure the patient's knees and thighs should be kept flexed by pressure of the operator's knee. Then with the patient still in this same posture the fingers of the operator's two hands should be placed over the spinal-rib area where the diaphragm attaches on the two sides and he should pull forward while the patient is inspiring and relax when he is expiring. For about twenty respirations the force of the traction can be increased by pressure over the ribs which should be given simultaneously with inspiration; then the extra pressure can be stopped for twenty respirations. During this treatment it is possible to note any areas of the thorax which are specially rigid and non-responsive and give them additional attention. Finally, thorough articulation of the vertebrae

and movement of the ribs should be carried out with the patient lying on the face.

The diaphragm is the structure which regulates and co-ordinates the functioning of the thorax, in which we find a condition very similar to that which we find in the cranium; in both the roof is solid and the floor elastic and flexible. In the thorax rib one is practically immobile and, with its attachments, forms a solid roof except for the passage way for the pharynx and larynx, while the floor is formed by the diaphragm. The diaphragm is a fibro-muscular sheet lying between the thoracic and abdominal cavities. On the superior and inferior surfaces we find fibrous material in the form of a sheath and right over the surfaces of these fibrous layers the blood vessels and nerves pass towards the muscle. Again on the outside of these in fusion with the sheath there is another fibrous layer which acts as the supporting base for the serous coverings and is the foundation for the fluid which is thrown out in connection with absorption and transudation.

Over the upper surface of the diaphragm we find serous walls which form the pleura at the sides and the pericardium in the median portion. This means that both the pleura and the pericardium are continuous with the serous walls and that both these structures have a fluid function in connection with secretion, absorption and, in pathological states, transudation. On the under surface, but not continuous with the upper surface we find a similar covering which forms the origin of the peritoneum. Pleura, pericardium and peritoneum therefore are all in origin serous structures and their distinctive function is secretion and absorption.

The most nearly fixed part of the diaphragm is that which is held in position by the pericardium. This gives a point of solid attachment to the diaphragm, all the other parts being elastic and mobile around this fixed point. The fibrous part of the pericardium is attached to the undersurface of the sternum and is continuous with the sheaths of the larger blood vessels. These last are in turn continuous with and originate in the fascia of the lower cervical area, thus providing a direct line of continuity from the lower cervical area to the fibrous structure of the diaphragm. This means that the upper surface of the diaphragm is held in position by a continuity of fibrous sheets starting in the root of the neck, passing down under the sternum and terminating in the diaphragm. This throws an important light on the value of neck traction by which effects are produced on the diaphragm. At the central portion of the diaphragm there is a certain amount of depression when the muscle contracts, but this contraction is

limited by the elasticity of the fibrous sheets extending downwards from the neck. This implies that the stimulus to the musculature of the diaphragm originates at the base of the neck in the fascia and is transmitted through the fibrous supports that extend downwards anteriorly to the upper surface of the diaphragm. It should specially be noted that this support of the diaphragm starts in the neck and is entirely limited to the anterior thorax and that the sensory stimulus to visceromotor activity, because it originates at the base of the neck, is taken entirely out of the thorax. The stimulus to all thoracic movements is extra thoracic and limited to the area C5-7 including all the area anterior to C5-7.

The peripheral attachments of the diaphragm are found in connection with the lower six ribs and their corresponding costal cartilages. Extending anteriorly from the posterior parts of the twelfth and eleventh ribs, the attachment passes to the cartilages of ribs ten, nine, eight and seven. The sixth rib has a protective function, that is to protect the peripheral attachments of the diaphragm from irritating influences which may be exerted on it from above down, such irritation operating from ribs two, three, four and five and travelling from the head of the rib forwards. This implies that if the diaphragm is normal or inactive from the side of its peripheral attachments, the best stimulus is articulation or stirring up in some way of ribs two to five. It should however be noted that this stimulus does not pass either as a circulatory or nerve stimulus, but operates entirely from the side of visceromotion through rib, intercostal muscle or costal cartilage action on ribs seven to twelve. On the other hand if the diaphragm is irritated from below upwards, as it sometimes is in cases of asthma, then we should inhibit the movement of ribs seven to twelve. This may be done by inhibiting along the rib from the costal cartilage to the head or by pressure of the hands placed laterally over those ribs from the costal cartilages back to their heads.

The arrangement of the muscle fibres of the diaphragm at their points of origin is important. The fibres of the diaphragm pass directly backwards from their points of attachment to the lower surface of ribs five to seven and the fibres of the transversus abdominis pass directly forward from the same points, so that the two sets of fibres cross each other practically at right angles. This necessitates that the attachments should be able to move to the point at which the contraction of muscle is most effective. In this case the most effective point for purposes of contraction lies in the middle of the muscle and, therefore, the maximum contraction is found midway between complete extension and complete flexion. The most perfect

balance of the diaphragm in activity is thus marked by the complete extension of the rib attachments and the complete flexion of the transversus or vice versa. A similar arrangement is found as between the diaphragm and the psoas muscle. In this sense the psoas may be accepted as compensatory in action to the transversus abdominis as far as the diaphragm is concerned. The functional activity of the diaphragm depends largely on the range of movement of these compensatory muscles in the abdominal field. This explains why the integrity of the abdomen in its muscle functioning is the necessary foundation on which diaphragmatic activity rests, and why the spinal centres corresponding with the abdominal muscles have a controlling effect on diaphragmatic action.

A mass of fibres originate from the first to the third lumbar on both sides and pass upwards and inwards to form the crura of the diaphragm. Connected with these crura there is a vacant area close to the vertebral column on the two sides where the border of the diaphragm does not make a strong attachment to the posterior thoracic wall. This is the bridge between the arteries. Lateral to these arches there are smaller arches which give the diaphragm its compensatory connection with the proximal parts of the psoas. These in turn are bridged by the posterior fibrous borders of the diaphragm forming the lumbo-costal arches and providing medially attachments to the bodies of the vertebrae and the transverse processes of L1, and laterally to the tips of the twelfth ribs. This gives us three distinct points at which lesioning may occur in connection with the diaphragm, the psoas and the transversus abdominis, namely, L1, L1-3 and rib twelve. The central fibrous sheet of the diaphragm is something like a three-leafed clover, each part being attached to distinct groups of muscle fibres. Thus:

(1) Fibres which originate from the ribs and costal cartilages run parallel with the long axis of the ribs up and back towards the central tendon. Contraction of these fibres under normal rhythmic conditions will lift up the anterior chest wall without bringing sufficient force to bear to approximate the two sides of the chest wall towards the median line. These muscle fibres, therefore, operate in line with, and determine the direction of, the movements of the ribs as well as determining the activity of the diaphragm. There is also a series of muscle fibres extending from the scaleni muscles which are attached to the cervical vertebrae and passing directly downward and forward through the series of costal interspaces, thus intermingling in their distribution with the intercostal muscles. Contraction of these fibres causes the elevation of the anterior ends of the ribs and lifts up the sternum, thus increasing the antero-posterior diameter

of the upper thorax as a basis for diaphragmatic action. The elevation of the angles of the ribs will tend to increase the lateral diameter of the thorax. This explains why we get lateral rather than antero-posterior expansion when we deal with the rib from its angle and thus attempt to modify its curve. The value of this procedure is that it furnishes a means of stimulating, through the diaphragm, the viscera in the mediastinal field.

(2) Fibres at the periphery of the diaphragm are short and parallel so that the lower margin of the thorax, represented by the lower six ribs and the corresponding costal cartilages, operates as a cage and moves simultaneously so as to produce co-ordinated diaphragmatic action. This explains why rib lesions below rib seven interfere with the action of the diaphragm, unbalancing the lower border of the thoracic cage and thus throwing the whole burden of thoracic and diaphragmatic movement on the upper part of the diaphragm. This also explains the presence and effect of secondary lower cervical lesions where fibres of the dilator muscles of the upper thorax originate.

(3) The crural fibres pass directly upwards until the level of the diaphragm is reached and then turn forward and fall in line with the general shape of the diaphragm. These fibres cross directly anterior to the aortic opening and recross directly anterior to the oesophageal opening, forming a sort of figure of eight. The fibres are fused together and finally insert into the central fibrous tendon. The lateral borders of the crura continue in line with the costal fibres from the twelfth rib and this makes the twelfth rib a conditioning factor in the movement of the crura with secondary reactions on the aorta and oesophagus.

When the diaphragm is in a state of complete relaxation it is domed by reason of the pressure which is exerted in the thorax by the joint action of the viscera and the force of the abdominal muscles. The height to which this dome rises is increased during expiration when the diaphragm relaxes and the chest walls fall with a decrease in both the lateral and the antero-posterior diameters. Hence, when the dome is at its highest and the pressure on the diaphragm at its greatest the peripheral attachments and fibres are at their minimum of activity. This represents the lower arc of the circle formed by the diaphragm in its activities which balances against, and co-ordinates with, the fibres in the upper thorax. Thus the spinal balance is between 3-5C and L1-3 areas of the spine.

The nervous control of the diaphragm is principally represented by the motor nerve supply coming via the phrenic nerves from 3-5C. In addition

the tenth cranial nerve distributes its sensory fibres via the lower six intercostal nerves. The intercostal nerves in addition to supplying motor stimuli to the diaphragm activate the muscles in the abdominal walls and the muscles in the intercostal spaces, co-ordinating muscle action so as to make the diaphragm an effective regulator of respiratory action. The sensory stimuli passing from muscle, tendon and articulations to the spinal cord produce a response in the contraction and relaxation of the different muscle groups and this is the foundation on which thoracic cage movement is built. Tension variability is the foundation of co-ordination and this explains the value of inhibition from D5 to D12 as a means of establishing co-ordination of respiratory activity and removing the inco-ordination which produces such a condition as hiccoughs.

A good example of this is found in a case in which we find one rib, for example rib eight, solid or twisted and reacting on the diaphragm so as to produce hiccoughs. In such a case the muscles in connection with the rib have become hypersensitive owing to inco-ordination and the hiccough spasms are the expression of spasmodic contraction of the group of muscles as it reacts on respiration through the diaphragm. This brings out the fact that diaphragmatic contraction and relaxation is the foundation of the regular control of respiration. As relaxation is a reaction from contraction, we must look upon the contraction as the essential factor in the control. This contraction of the diaphragm produces the following changes.

First, the crura cause depression of the posterior margin of the diaphragm and at the same time pull the central tendon backwards. This gives us a definite fixation of the central tendon and establishes the central axis around which all diaphragmatic action takes place. Secondly, the fixation of the central tendon operates against the peripheral fibres of the muscle as they lie parallel to the long axis of the rib and it is the rib attachments which give the pull in connection with the contraction. As the peripheral fibres contract the upward curve of the dome diminishes until the entire sheet becomes flattened, and then, by reaction, there is an elevation of the lower borders of the thoracic cage. This in turn tends to maintain or increase the flatness, while depression of the centre is prevented by its pericardial attachment strengthened by the solid sternum and the fascia extending from the lower cervical area to the middle of the diaphragm. Thus the two operative centres in control of the visceromotor action of the thoracic cage are D6-12 with the corresponding ribs and intercostal muscles, and C3-5 together with the fasciae which are the fields of distribution, while the sternum offers solid resistance and so regulates

the degree of contraction. Therefore when the diaphragm is inactive or in a state of uncoordinated activity we should correct lesions to be found in the lower cervical area and from D6-12 and should follow this by articulation in these areas, by simultaneous bilateral pressure over ribs six to twelve and by steady pressure from anterior to posterior over the sternum, regulating the pressure by relaxing it at each inspiration.

The relation of the diaphragm to the viscera is important not only in connection with the functioning of the diaphragm itself but also from the point of view of the visceral organs. On the upper side of the diaphragm we find the lungs and the heart. Normally the lungs are so elastic and mobile that they do not interfere with the phrenic stimulation of the diaphragm; normally also the pericardial sac is large and mobile enough to insure that its inferior attachment to the diaphragm is broad enough to prevent pericardial tension from crippling the co-ordinate movements of heart and diaphragm. However, this tension may become unduly increased especially when associated with a lateral dragging on the diaphragmatic attachment of the pericardium which is always due to an inequality in action as between the two sides of the diaphragm.

So when the heart is disturbed by an inequality of thoracic tension the cause is always an inequality of tension of the two sides of the diaphragm. In dealing with this condition one must attempt first to discover which side is deficient. Test by placing the patient on his back and making him breathe deeply and then periodically raising the arms up at right angles to the body and slowly pulling them up above the head. By careful observation it can be seen on which side there is a dragging of the diaphragm and thorax, and the side on which there is dragging is the weak side. To correct the condition give treatment at the lower cervicals and at D6-12, as indicated before, and follow this by lateral pressure on the weak side only, simultaneously applying compression from posterior to anterior over the sternum until the two sides become co-ordinated. Sometimes a sudden increase in pericardial tension due, for example, to an increase in pericardial fluid, may decrease the freedom of movement of the central tendon and thus cause an asthmatic type of breathing. Treat this condition in the same way, looking at it as a case in which the left side of the thorax and diaphragm is restricted in movement.

On the under side of the diaphragm we find liver, stomach, spleen and kidneys, the liver accounting for about three-quarters of this surface. Normally the upper surface of the liver is fused with one portion of the

central tendon and therefore wherever the diaphragm goes the liver moves accordingly, but when the diaphragm does not move neither does the liver. In this latter case there is an internal hyper-pressure in the thoracic cavity. To deal with this first give thoracic pump treatment with the cushion parts of the hands just under the clavicles and the fingers extending downwards and outwards over the thorax. While doing this apply inhibition with the cushion parts of the hands when the patient is inspiring and with the fingers when he is expiring and continue until the abdomen begins to show a reaction by rising and falling on its own. After this place one hand over the sternum for compression and the other laterally over the lower six ribs on the right for lateral pressure and give treatment as before, again until the abdomen shows a positive reaction. In dealing with the stomach, spleen and kidneys always do so through the liver and then follow this treatment by abdominal pump treatment, the cushion of the hand placed over the organ involved in the particular case and the fingers extending up or down as the case may be with cushion pressure exerted during inspiration and finger pressure during expiration.

Contraction of the diaphragm produces a diminution in the contour of the dome which is accentuated by elevation of the lower segment of the thoracic cage. That is to say the co-ordination in contraction and relaxation is between the upper part of the diaphragm internally and the lower thorax externally. This co-ordination is possible and attains its maximum efficiency under the following conditions: (1) When there is normal fixation furnished by the attachment of the pericardium to the diaphragm, the sternum and the lower cervical fascia and when the crura bind the central tendon in connection with its forward movement in such a way that the peripheral attachments of the diaphragm are in full force in relation to the ribs. (2) When and if the abdominal viscera are freely mobile and the abdominal wall normally tonic so that there is normal intra-abdominal pressure. Since this pressure lifts the diaphragm any modification in abdominal visceral tone and position is an impediment to free upward movement of the diaphragm. Since also the downward movement is largely a reaction to the upward movement, it follows that the tone and position of the viscera and the tone of the walls exercise a control over diaphragmatic rhythm. (3) When the thoracic wall is capable of free mobility permitting coordinated contraction and relaxation of the diaphragm in relation to the abdomen, the condition of the chest wall, especially in its relation to the ribs and intercostal muscles, being the key to co-ordinated movements of the thorax and abdomen as cavities. The coordination and synchronous

movements of the different parts of the diaphragm depend on the integrity of the chest wall and its functional mobility plus the action of the various muscle elements within the diaphragm itself under the stimulus of respiration.

It should be noted that we must deal with the thorax as a whole by a different method from that employed in dealing with the parts of the diaphragm. In the case of the latter we must first establish thoracic integrity, then re-establish normal co-ordination between the diaphragm and abdomen. But in dealing with any of the contents of the thorax we should use respiratory activity in relation to the central tendon of the diaphragm, the pericardial attachments and the crura especially in their relation to the attachments of the lower six ribs. These are the three special factors to be dealt with in all pulmonary and bronchial disturbances and we must deal with them by using the respiratory activity of the patient, making the patient breathe more or less deeply in connection with all our corrective work applied to the diaphragm, the thorax and their attachments.

The diaphragm must be regarded as alive and in a state of activity, otherwise nothing can be done for thoracic diseases. Embryology explains why the diaphragm receives its nerve supply from two sources, namely, the lower cervical segments of the cord via the phrenic nerve and the lower dorsal segments via the intercostal nerves. These two sets of nerves cover all the visceral activities of the diaphragm. By means of its nerve supply the diaphragm is co-ordinated with the other viscera, especially through the splanchnic nerves. The sensory side is represented by the tenth cranial nerve together with the third, fifth and seventh cranial nerves and the cervical nerves operating through the superior cervical ganglion.

Diaphragmatic movement as seen on the x-ray screen indicates that the diaphragm responds to the respiratory stimulus in the following manner. The central tendon is forced downwards with the shortening of the muscular part of the diaphragm, with the result that the diaphragm is drawn from the ribs so as to provide an open space into which the lungs fall at each expansion. Thus the muscle of the diaphragm is the active force in movement and expansion and the ribs are the active force in preparing an open space for lung expansion. To these points a third may be added which is observable under x-ray, namely that the liver and the stomach are subjected to great pressure by the lung movements. Therefore the action of the diaphragm is essential, not only to respiration, but also to the proper functioning of heart, liver, stomach and, probably, other organs.

The diaphragm exerts a strong influence on blood circulation, not only of the trunk, but also of the extremities. Through the rhythmic activity of the diaphragm the correlation of intra-thoracic and intra-abdominal pressure is maintained. The diaphragm thus practically controls not only the passage of blood from the thorax but also the entrance of blood into the thorax, so that it is a strong stimulating and co-ordinating force in normal heart action. The hepatic circulation, too, is influenced by the diaphragm, being stimulated continually by its alternating pressure. This is because of the structural attachment of the liver to the diaphragm which causes liver rhythm to respond to thoracic and respiratory movements. This explains why, in surgery, an hepatic abscess can be drained more effectively via the thorax than via the abdomen. The diaphragm is also associated with the circulation in other abdominal organs because it is always exerting a series of alternating pressures on spleen, stomach, pancreas and intestines. In abnormal conditions of these organs this pressure often tends to assist nature as, for instance, when a cancer in the liver reaches that part of the organ which is in contact with the diaphragm to have its progress stopped by the action of the diaphragm. On the other hand diaphragmatic movement may increase pain and tend to extend infective processes in these same organs, and in these circumstances it is necessary to inhibit action and make the patient rest.

Diaphragmatic action exercises control over vomiting, defaecation and parturition. For example, in constipation, one of the best lines of visceromotor treatment is to promote increased contraction of the diaphragm. This increases intra-abdominal pressure, changes the blood content in the field of the intestines, increases the discharge of digestive and lubricating fluids and prevents stagnation of the abdominal viscera; in fact, both digestion and elimination may be stimulated by stimulation of diaphragmatic activity.

When the abdominal viscera are normally correlated to the diaphragm, diaphragmatic movements stimulate internal activity even in the sections of the intestine which move under specific nerve stimuli. X-ray examination indicates that movement is more marked when there is gas accumulation in the intestine which tends to show that there is action and reaction between the diaphragm and the internal segments. When the intestine under such conditions, becomes atonic, the peristaltic action of the intestine becomes slower and the various segments seem to lose their coordination. The two areas which seem to suffer most in this way are the ileum and the jejunum, and dilation in these parts is accompanied by venous congestion and slower

peristaltic action. Increasing respiration by means of deep breathing or by stimulation of the diaphragm tends to increase the movement of these two parts, although the dilation may continue.

It should be noted that if the intestines and stomach are gently pulled so that they slightly drop away from the diaphragm and liver, the movement of the intestines and their content is increased. This seems to indicate that in the developing stages of ptosis the change in the position of the stomach and intestines at first has the effect of intensifying peristaltic action. This continues to the point at which there is a reaction on the diaphragm which, in turn, modifies the diaphragmatic stimulation of peristaltic activity, and the end result may be the entire cessation of peristaltic movement in the intestines, producing a visceromotor type of constipation. It may also be noted that an increase in the rate and depth of respiration, especially under artificial stimulation, may tend in some cases to produce a hyper-activity of the diaphragm combined with hypo-activity of the intestines. In such cases the special stimulus seems to be passing to the liver and stomach, which are directly stimulated by the increased diaphragmatic action: but because a greater degree of toxaemia is thereby produced, the intestines are affected by a toxaemic torpidity and we have the starting point of a toxic type of constipation. The treatment indicated in order to get an after effect of respiration on the intestines in such a case is to keep pulling the stomach and liver gently downwards so as to prevent direct respiratory stimulation of these organs and to concentrate the beneficial effects on the intestines. The method employed is first to apply gentle pressure over the lower thorax while the patient is breathing deeply and to follow this by a gentle pulling movement downward over the stomach.

In coughing, hiccoughs and sneezing the respiratory movements are more or less reversed in direction, the action of the diaphragm clearing the nasal and pharyngeal passages and also stirring the circulation in the abdominal organs. In much the same way the increased contraction of the diaphragm affects brain functioning, for example, in certain emotional states. In such states diaphragmatic activity is intensified as the result of the respiratory centres receiving extra stimulation, and a reaction takes place through the lower cervical and phrenic nerves. This explains the heaving of the chest in sobbing, in which the lower cervical nerves stimulate the central tendon, thus giving the initial stimulus to the median portion of the thorax, and then when the phrenic nerve comes into operation the diaphragm at its lower borders is stimulated, causing a counter-reaction on the two sides.

This raises the interesting question of the voluntary control over emotional conditions of this kind. The volitional centres operate entirely through the automatic centres in the medulla, that is to say, there is no direct voluntary control of the diaphragm or the thorax in their emotional expressions, the inactivity of the diaphragm either in relaxation or in contraction being a purely reflex condition. This seems to imply that the voluntary control of these emotional respiratory manifestations is practically impossible except in so far as the reflexes in the lower cervicals and lower dorsals can be brought under the influence of the higher centres, because all these reflexes are controlled by the diaphragm in connection with the activities of the phrenic, tenth cranial and intercostal nerves which in turn are controlled from the centres in the medulla. From these medullary centres nerve impulses pass downwards within the spinal cord to the medio-lateral cell groups at C2, 3 and 4, from which, as a general centre, the impulses are distributed to the anterior horn cells in the lower cervical and lower dorsal regions, where they are picked up by the phrenic and intercostal nerves. The fact that this distributing centre is at C2 to 4 explains the secondary reaction which we get through the facial, hypoglossal and spinal accessory nerves. Impulses which pass to and from the respiratory centre and the centres which control heart action are all associated with this same centre, and this explains why we find lesions at C2, 3 and 4 in so many of the thoracic diseases.

It is important to remember that the respiratory centres and the tenth cranial nerve centres are bilateral, though the two parts of the centres are bound together by associational fibres of the dendritic order. Normally the two half centres operate synchronously, but this takes place only when movements of the two sides of the thorax are free, simultaneous and co-ordinated. As soon as the movements of one side of the thorax are interfered with, the interaction of the two halves in the respiratory and tenth cranial centres is disturbed. This indicates that the normal stimulus of respiratory action and secondary heart action, especially in relation to blood pressure, depends on the coordinated movements of the two lateral halves of the thorax. Hence in all respiratory and heart conditions one of the first corrective procedures to be undertaken is the coordination of the two sides of the thorax. This is why we emphasize the importance of using lateral pressure simultaneously on the two sides of the thorax when we are trying to promote coordinated movements of the diaphragm. In this connection it should be noted that when we are giving thoracic pump treatment we should begin by giving bilateral pressure on the sides before

giving anterior pressure. Such a treatment is often valuable as a temporary palliative in cases of high blood pressure and other conditions.

The action of the respiratory centre and respiratory activity generally depend very largely on the quality of the blood circulating through the centre. Lack of oxygen brings about an increase in the respiratory movements and a very small increase in the concentration of carbon dioxide causes a disproportionate increase in the respiratory movements. This is intensified when fatigue products and acids derived from bacterial action, putrefaction or other causes are present in the blood stream. This implies that to attempt to control the circulation of the blood in the centre, either as to rate of circulation or as to quantity, is, at best, but a palliative measure. The centre must be reached in some other way if we are to get decided and permanent effects through it.

We must remember the nerve pathways along which impulses are carried to the centre. Descending impulses from the cerebrum give a bilateral control of respiratory movements from the volitional side; descending impulses from the basal ganglia bring the movements under the influence of the emotional and instinctive activities. The superior laryngeal nerves give stimulation to expiratory movement; for example, cough reacts on respiration because of the irritation of the laryngeal membrane and this modification of respiration is, in turn, kept under control by two other reflex actions, namely, the activity of the glottis and the stimulus of the forced expiration which the cough produces. The glosso-pharyngeal nerve is an inhibitor of respiratory movements and is the agent of the temporary inhibition of respiration during deglutition. The trigeminal nerve is the pathway along which irritation passes when respiration is modified in the process of sneezing. The sensory nerve endings in the skin operate as stimuli to the normal process of inspiration, and excessive skin stimulation may cause a forced contraction of the inspiratory muscles with a temporary cessation of respiration. In such a case syncope may allow the return of normal respiratory movements and this suggests that the best line of osteopathic treatment for syncope is stimulation of the skin plus the stimulation of inspiration by the lateral pressure treatment on the two sides of the chest. The tenth cranial nerve, operating as a visceral sensory nerve, causes forced expiration and deep expiratory movement normally has its stimulus in the abdominal organs; a thing which explains why deep breathing with forced expiration reacts beneficially on the abdominal organs. As we have seen, the activity of the respiratory centre is always dependent on the quality and pressure of the blood flowing through the

centre and, moreover, the pressure is dependent largely on the amount of carbon dioxide in the blood. This is the reason why venous blood with an excessive carbon dioxide content acts as an irritant, the irritation affecting not only the medullary centres, but also the cerebral and basal ganglion centres.

It should be noted that, embryologically, the diaphragm originates from five sources, the fifth source being the mass of mesoblastic cells located in the area of the upper five cervical vertebrae. These mesoblastic elements give origin to the heart, the liver and the diaphragm, the cells from the fifth cervical segment being specially concerned with the origin of the phrenic nerve. This explains the development of the phrenic nerve in relation to the upper cervical spine and its downward development via the spinal cord into the sympathetic and intercostal field.

To summarize, it may be stated that the diaphragm functions in the following ways, namely, (1) in the control of respiration, (2) in assisting to stimulate blood circulation, (3) in controlling tone and peristaltic activity in the intestine, and (4) in the elimination of wastes by its influence over the lymphatic fluid and lymph circulation.

THE OSTEOPATHIC TREATMENT OF ACUTE DISEASE

STAFF LECTURE

The foundation of any treatment in the acute diseases is accurate diagnosis. The best method is that of exclusion in which all symptoms are obtained and compared with those found in other diseases. The differential method is then applied to the remaining symptoms to compare the analogues and contrary points, the final diagnosis being based on the contrary symptoms. Lastly we must remember that while all disease is general we must regard the symptoms from the standpoint of the patient concerned. These will vary according to the constitution of the patient and we must interpret the symptoms in the light of that constitution. All palliative treatment is built on that aspect of diagnosis because we are trying to build up the constitution of the patient and encourage the development of immunity.

Mental symptoms are typical of the personality of the patient, indicating his desires, instincts and peculiarities. Mental wavering may give rise to delirium, and the presence or absence of this mental condition may determine whether the patient will be delirious or not.

On the objective side we have the pulse rate, temperature and the osteopathic lesions which are the anatomical side of diagnosis. Purely physical methods deal with mechanical abnormalities with the related pain, sensitiveness and tenderness, rather than with symptomatology. Pathology is abnormal physiology which gives place to morbid anatomy if the condition persists. Palliative treatment is given in the stages of pathology before any attempt is made to cure the patient, in order to maintain vitality while the disease runs its course, so that morbid and other undesirable changes will not take place.

It is essential to distinguish clearly between acute and chronic disease. In acute disease there is a sudden change in some of the vital processes, the expression of which is found in sudden high temperature, rapid pulse and rapid emaciation. In chronic cases the altered physiology has settled down and become habitual and if the disease process is limited to this stage it is curable, but if it has reached the morbid anatomy stage it is not curable unless it is confined to a small area.

In the osteopathic treatment of acute disease it should be noted that mobility depends on the thorough articulation of every part of the body,

and on the proper functioning of the sympathetic and para-sympathetic nervous systems, and all discussion of the treatment of temperature, secretion and glandular function is through these two systems.

Examination from the chemical point of view is carried out by means of analysis of the blood, urine, sputum, toxins, germs, etc., but from the physical standpoint it is essential that each and every part of the body is adjusted to the structure of the body as a whole.

TECHNIQUE

In order to discover if there is any imbalance in the body or not, the patient should be placed in the prone position with the feet apart and a pillow under the chest to prevent tension in the hips, pelvis and lower spine. To test for mobility apply finger pressure over the spinous processes and palpate for contractions in the superficial muscles. Then look for positional change in the spinous processes and hot, cold or sensitive spots along the spine. Deeper pressure is then applied to the soft tissues around the spinous and transverse processes.

THE RIBS

These should be examined posteriorly and laterally, pressing upwards with the flat of the hand, then with the fingers only at an acute angle and, finally, with finger pressure between the heads of the ribs and the vertebrae. Look for abnormal rib movement and tension, indicated by rigidity and tenderness over and around the ribs.

The floating ribs should be examined from the back using the middle fingers and palpating from the front to the back in conjunction with strong pressure at the attachment of the rib. If the rib is abnormal and the patient feels pain, note where it begins and reinforce pressure at the spinal attachment with both hands in order to spring the rib and locate abnormal movements, pain and tenderness.

To examine the scapulae press upwards from the inferior angles with the middle fingers and trace out the entire margin from the lower border while pushing the fingers of the other hand between the scapula and the ribs. Then commencing at the acromio-clavicular joint, pressure is applied over the scapula in conjunction with arm movement, and the leverage may also be applied to the ribs underlying the scapula. To check the relation of the scapula with the clavicle and neck muscles, hold the scapula firmly and

gently sidebending and rotating the head in extension from side to side, watching the scapula movements in the meantime. The head movement is then directed to the opposite side in order to lift the scapula as the patient is instructed to move the arm backwards and forwards. Watch the acromioclavicular joint and note how the scapula, shoulder joint and clavicular attachments move or remain motionless and note where any tension is located. These movements will test the degree and type of movement in the scapula and disclose any pain, the type and origin of which should be noted.

With the patient on his back apply slow and gentle movement to the head and neck to find out its relation to the body trunk, then, while gripping the head between the two hands, the fingers palpate at the occipito-atlantal articulation as the head is moved, first in simple rotation, then combined with sidebending and forward and backward flexion. In this way all the head movements in relation to the neck are tested with special reference to the point of origin of any resistance.

This process is repeated down the cervical area until at 7C the finger and thumb are placed over the transverse processes of 1D as a point of resistance to movement at 7C. This junction point between the cervical and dorsal curves represents co-ordination between the two areas of the spine and is an important lesion in the acute diseases. Disturbance between the head and the thorax settle at this point, and in treatment the best results are obtained by inhibition and stimulation at this level. It is important to note whether the resistance comes from above or below, as this locates the condition either to the cervical or dorsal areas.

In the examination of the anterior chest apply the arm leverage at right angles to the body and follow by gently rotating above the head and circling downward over the chest. At the same time apply pressure with the fingers at the sternal attachments, at the angles and at the heads of the ribs from above down, noting the points of resistance, pain and pressure. Repeat the movements as the patient breathes deeply, and note which points survive the exercise, these representing the weakness of the thorax and the spine. These same tests may be applied to the abdomen using the leverage of the legs and with pressure of the fingers over the abdominal aorta, and with the finger and thumb over the two plexuses of the colon and in the inguinal region, then with the hand over the stomach and the lower abdomen as the patient breathes deeply and note again which of the points survive.

THEORY AND PRINCIPLES OF TREATMENT

All osteopathic treatment is based on mechanical principles which must be converted into the physiological equivalent if it is to be of any value. Sensitiveness and tenderness are conditions of the surface of the body, which, in the first is brought out by touch, and in the second by pressure, while pain is a subjective manifestation of an internal condition. These three conditions necessitate palliative treatment which is all that can be done until the deep-seated cause of the acute condition is properly interpreted. Therefore, treatment in the acute fevers must be given frequently, perhaps every fifteen minutes, and, at the crisis, which is the culmination of the acute conditions in connection with the febrile process the treatment must be directed towards the upbuilding of the constitution of the patient and the control of circulation. Crisis always involves circulatory disturbance but this may be preceded by a nervous condition.

In this upbuilding side of the treatment there are three special points for attention. (1) The circulation of blood, with special emphasis on vasomotion. (2) Respiration, more particularly in relation to movement of the abdominal organs, the treatment here being either thoracic or abdominal lymphatic pump. (3) Nutrition. This is dealt with in relation to 4, 5, 6D, which represent the point of communication between the upper and lower parts of the body. If the heart does not respond to this treatment its action may be accelerated at the middle cervical area giving secondary effects on the heart sympathetically through the middle cervical ganglion, and parasympathetically through the 10th cranial and other cranial nerves. From the inhibitory side the effect is gained through the 10th cranial nerve in relation to the superior cervical ganglion which is sensory from the centre in the cranium, and at the inferior cervical ganglion which is directly sympathetic and also functions indirectly through the depressor nerve.

The respiratory treatment consists of gently and slowly raising the ribs commencing with the lower ribs, and if the abdomen is tense the diaphragm may be relaxed by rhythmic treatment in the lower splanchnic area at 9-12D. This may be followed by direct stimulation to the vasomotors to the lungs from 3 to 7D except in the case of asthmatic conditions or spasms of the chest in bronchial disturbances when this treatment should be given from 7D upward to 3D. The abdomen may be relaxed by inhibiting with one hand from the inguinal region on both sides while flexing and rotating the legs. If the abdomen is still tense give strong extension of the legs with deep inhibition over the solar plexus.

The nutritive treatment begins with stimulation to the stomach at 4-6D followed by deep inhibitory pressure over the cardiac end of the stomach, then stimulation at 6-7D, then deep pressure over the duodenal end of the stomach and then stimulation of the right 10th cranial nerve along the side of the neck. This gives us direct stimulation of the two ends, orifices and body of the stomach. In the case of the liver, stimulation is given at the right of 6-10D simultaneously with direct inhibition over the liver itself with the palm of the hand.

The main obstacle in acute diseases in dealing with nutrition is venosity of the blood which acts as an irritant and prevents the arterial blood from preparing the proper materials for nutrition. This must be dealt with through the general circulation by means of stimulation to the vaso-motors upwards from 2L-2D, followed by strong stimulation to the superficial and deep circulatory centres at 3-5D. Follow this with gentle treatment from 1D-1C gradually increasing in force, then direct stimulation along the sides of the neck to the two carotids and finish with inhibition upward from the clavicle along the left carotid in order to establish a soothing effect to the heart and brain circulation.

It should be noted that all types of diarrhoeic conditions which arise in the course of acute disease are associated with excessive venous blood, and in these cases the treatment for dealing with blood venosity should be followed by strong inhibition from 4D up to the occiput, in order to inhibit impulses which are passing to the brain. It should be remembered that the final test of any system of therapy is its ability to deal with acute disease, and that osteopathy applies equally to acute disease as it does to the chronic. The main factor predisposing to acute disease is a poor condition of the body cells and tissues locally which makes possible the existence of congestion, toxæmia, starvation or blockage, so that a patient does not die from the lack of vitality but because the body cannot be liberated from some obstructive condition which makes life impossible. Therefore in the incipient stages the treatment should be directed to clearing up the impediment or toxic condition, but if the disease has started the body immunity must be built up to lessen the hold of the disease on the constitution of the patient, and if the disease is established we must try to shorten its course. In treating these acute cases we must aim to reverse the direction of the development of the disease, and turn it backward towards the beginning.

Another point that should be noted with reference to the acute diseases is that all vitality and energy is localised in the internal organs, especially the lungs and the heart. Externally, this vitality is expressed in the muscles through the superficial peripheral circulation which is a natural provision for the assistance of the internal organs so that in all acute diseases the general palliative treatment is centred at 3-6D for the control of the deep and superficial circulations. In cases where the muscles are flabby and relaxed there is always a reaction on the nervous system through the minute sensory nerve fibres and the patient should be kept active. Posture is important, especially in spinal diseases such as meningitis, in which case the patient should lie on the face to prevent spinal cord congestion. Similarly, in bronchitis the ribs and tissues in relation to the ribs must be released after which a hot pack is applied to the chest followed by a cold pack. This is allowed to become warm and the patient is encouraged to move about. This principle applies to the treatment of pneumonia.

Fever is Nature's attempt to oxidise something which is not wanted and temperature should not be reduced unless it is uncontrollable. Heat is produced in the body because it is warmer than the surrounding atmosphere, and the increased combustion represents an excess of waste products which irritates the nerve centres and produces increased respiration and heart action. In the febrile process the heat is produced in the deep tissues including the liver and the glands as well as the muscles and the treatment must be directed to bring the deep blood to the surface by means of stimulation at 2-4D. Under normal conditions heat passes away from the body via the excretions including the skin and the under-garment should be able to absorb heat which means that silk, cotton or linen should be avoided. Perspiration gets rid of heat in evaporation and we must make sure that the skin, superficial capillaries and sweat glands are kept active in the febrile conditions. Never use cold water on the skin in the acute diseases.

Under normal conditions the circulation is controlled by the rate and force of the heart action, and the changes that take place in the calibre of the arterioles under vasomotor control. The heart is controlled by accelerating and inhibiting nerve fibres, the double action taking place through the centre in the medulla. Therefore we do not deal with the heart through the ribs or through the spinal centres but only from the occiput which must be kept loose and free. To control the small arteries our attention must be localised in the vaso-motor field of control for the heart and not 2D-2L because the medulla centres control the general circulation

entirely through the abdominal blood vessels which act as a reservoir of blood between the deep and superficial circulations. This local area for the control of the minute arterioles in the abdomen is at 2D-6D.

In the treatment it is impossible to palliate the condition until the irritating lesions have been removed. Having done this an attempt is made to control the nervous system to quieten the functional irritation which has been created all over the body by the febrile process. This may be done most effectively by inhibition to the solar plexus, followed by spinal inhibition to check sympathetic irritation, and rhythmic treatment to dilate the superficial arteries, which, by the reaction of constriction will reduce the excess superficial blood. If the brain is involved treat upwards along the spine, then after allowing the patient to rest for about 15-20 minutes stimulate elimination through the kidney. This may be done by steady inhibition at 12D, followed by rhythmic treatment at 9, 10, 11 and 12D, and at 2, 3L to stimulate elimination from the pelvis of the kidney to the urethra. Finally, strong stimulation is given to the sacro-iliac in order to gain para-sympathetic control over the entire field of elimination reacting through the cerebro-spinal fluid and the cranial nerves.

In dealing with the acute diseases the palliative treatment attempts to control the nerves through the nerve centres, and the heart through the arterial blood. Attention is then given to the abdominal circulation to throw the excess blood to the surface of the body and to keep this circulating at its maximum. Treatment is then given to dilate the skin arteries in order to stimulate the sweat system, and to stimulate the circulation through the kidneys at 9, 10, 11D. Supplementary to this each new symptom should be treated as it arises. Complications which settle down in the heart as the result of toxæmia should be dealt with by stimulation of the general circulation, while clogging and inflammatory conditions of the Eustachian tube and mastoid are dealt with through the lymphatic system.

The general treatment should begin with an attempt to establish normal blood and lymph circulation, to soothe the heart and control vaso-motion at 2D-2L or 2L-2D, to protect the head with treatment downwards along the neck, to watch for and deal with irritations as they arise. For example, a congested and enlarged liver giving rise to pain and rigidity in the right upper abdominal quadrant is treated by thoroughly inhibiting the entire erector spinae muscle and between the 8, 9, and 10 ribs, also at the corresponding vertebrae, especially over the transverse processes of 8-10D.

Similar conditions are found in certain areas which are due to inflammation and congestion, the irritation being transferred reflexly to the particular part involved. These special points occur at 3C for excess dilation in the eye; at 3D for excess constriction in the eye; at 2 and 3C in congestive and inflammatory conditions in the middle ear; at 3-5C for the nasal field; at 3-7C for the throat, especially tonsillar enlargement; at 2-4D for the bronchi and extended to 7D to include the lungs. The stomach is at 6, 7, 8, D on the left. The liver is 6, 7, 8D on the right. The kidneys at 9-12D in nephritis. 12D-1L when fluid in the kidney becomes solidified, in which case the spinal tenderness is accompanied by tenderness over the kidney itself.

BRONCHIAL ASTHMA

This is a disease characterised by attacks of dyspnoea due to contraction of the muscles of the bronchial tubes and to chronic inflammation of the bronchi, causing spasmodic obstruction of the smaller bronchial tubes. The condition is marked by a prolongation of expiration, which being a relatively weaker action, suffers greater interference than inspiration. Sometimes asthma will occur following an acute respiratory infection and should be differentiated from the bronchial spasm which occurs with chronic bronchitis and emphysema; in this case the attacks being slower in onset and in termination, there is equal difficulty in inspiration and expiration, and the patient is not free from respiratory symptoms between attacks. The asthmatic paroxysm usually occurs during the night either singly or several consecutively, and may last from an hour to several days. Generally, there is relief during the day. The onset is always sudden beginning with tightness of the chest and compression of the respiratory apparatus giving rise to an increasing dyspnoea. The patient will attempt to go into the open air, or will support the body with the hands and lift the thorax in an attempt to relieve the muscular spasm. The lungs become fully distended and the bronchial tubes constricted so that there is great respiratory effort with little thoracic movement. The diaphragm is lowered and the patient is subject to epigastric fullness and depression. The temperature may be normal or subnormal as a reaction from an excited nervous system. The attack usually subsides suddenly with a hard cough with little expectoration.

The lesions of importance which occur are those which, through nervous or mechanical influence cause interference with the mechanism controlling

bronchial tube musculature and function, or which are secondary to the condition when established, and tend to maintain it. Contraction of the musculature of the bronchi results from stimulation of the vagus nerve, and this can be affected by lesions of the occiput, atlas and axis. Lesions from 2-7T cause interference and irritation to the vaso-motor nerve supply to the bronchial blood vessels and to the intercostal nerves, thus affecting the muscles of respiration. Commonly affected are the rib articulations from 2-5T as secondary or maintaining lesions.

TREATMENT

1. Palliative treatment during the attack. Inhibition in the sub-occiput area to reduce activity of the 10th cranial nerve: and to the lower cervical area to affect the sympathetic cervical ganglia and balance sympathetic output. Assist respiration by thoracic raising and compression. Encourage the patient to remain calm and to breathe deeply.

2. Treatment between attacks. If bronchial asthma occurs as a complication of bronchitis, the primary condition must be treated first. Locate and treat contracted muscles, lesions in the thoracic area 2-7 and the associated ribs, paying particular attention to the vasomotor region 3-5T. Make any necessary adjustments to the occiput, atlas and axis with caution, followed by inhibition to reduce the possibility of vagus stimulation provoking an asthmatic attack. Observe the patient's respiratory movements to decide if he has any mechanical abnormality e.g. disproportionate movement between upper and lower thorax or between diaphragm and thorax, and obtain his co-operation in correcting this.

BRONCHIECTASIS

Partial or complete dilatation of the bronchial tubes, generally affecting the lower lobes, but may be widespread or localised to a small area. It is usually secondary to some condition that tends to weaken the walls of the tubes and therefore diminish the elasticity. Hence it is found secondary to bronchitis, emphysema, chronic tuberculosis, catarrhal pneumonia and in cases of pressure due to fibroids, foreign bodies, etc. The dilatation tends to take two forms, cylindrical, which occurs in the larger tubes, and sacculated in the smaller which have little muscle and no fibrous support. The mucous membrane and ciliated epithelium degenerate and may be replaced by fibrous tissue or cicatrix, which becomes stretched by coughing and the weight of fluid accumulation.

SYMPTOMS

The condition does not usually produce symptoms until the degenerative process is well established, and then the main symptom is the cough, worse in the morning and with changes of posture which induces a flow of mucus and purulent material from the affected area of the bronchi. Sometimes there is a recurrent haemoptysis. With the continuation of the condition the expectorant becomes purulent and foetid. The obstruction caused by ulceration and disintegration produces dyspnoea and in some cases the disease is complicated by heart or lung disease or acute bronchitis. The patient gradually becomes emaciated due to the presence of chronic sepsis.

PHYSICAL SIGNS

In the early stages there is only increased bronchial respiration with metallic rates. The percussion notes vary according to the changes in the lungs, the main characteristic being that they are less resonant and higher in pitch than normal. With sacculation the note is tympanic if the sac is air filled and dull if filled with fluid. Auscultation reveals bronchial breathing and coarse rales. Note that all sounds are cavity sounds, vocal resonance and fremitus being increased.

TREATMENT

The obstructive condition is caused by contracture plus the swelling of the mucous membrane, and in dealing with this there are several points of importance.

1. See that the vaso-motor supply to the bronchi is not affected by conditions of the upper T spine, viz 2-7T.
2. Check atlas and axis which may affect 10th cranial nerve.
3. Free the clavicles, and stimulate by lifting up the trachea.
4. Look out for accessory conditions such as tumours and goitre.

In Bronchiectasis the treatment is similar to that of chronic bronchitis with the following special points.

- (a) Pay special attention to the condition of 3-6T and ribs.
- (b) Look to any points at which the 10th cranial nerve may be involved directly or reflexly. There are four points at which this nerve can be reached:
 - (i). 1-2C, independent of its site of origin.

(ii). 4-5T via the sympathetic system. Treat in relation to the ganglia at the head of the ribs corresponding with 4-5T (producing visceromotor inhibition of the 10th cranial nerve reflexly.).

(iii). Just above the clavicle at the outer border of the lateral margin of the sterno-mastoid muscle, producing inhibition.

(iv). Along the sheath of the carotid artery for vaso-motor effect.

(c) Give treatment to reach the deep soft tissues along the spine. Secondly there is liable to be extensive osseo-ligamentous lesioning. These deep tissue lesions involve the visceromotor nerves to the muscular coats of the bronchial tubes.

(d) To assist in checking dilatation, pull up and stretch the trachea while giving it rhythmic and vibratory movements. This should be done frequently, daily in the severe case.

(e) Where there is sacculation, stimulate lung activity by:

1. Strong vibration over the lung area anteriorly.
2. Strong anterior-posture pressure.
3. Stimulating the lung centres at 4-5T.

CONGESTION OF THE LUNGS

There are two types:

The *active type* produced by the too rapid acceleration of the local circulation as a result of vasodilation or of a catarrhal condition of the lung. The *passive type* is the result of obstructed or impeded circulation.

Active congestion may be caused by lung disease, e.g. pneumonia, or by excessive or abnormal heart action, mental excitement, the sudden inhalation of too hot or too cold air. There is an increase in the amount of blood locally, thereby diminishing the air space and causing temporary partial consolidation. The physiological signs therefore are lessened fremitus, partial resonance and dullness due to consolidation; bronchial breathing heard chiefly at the base of the lung on both sides; dyspnoea with cough and expectoration which may contain blood. There is a feeling of thoracic depression, flushed face, full strong pulse, palpitation, congestion of the eyes. If there is a febrile temperature, there is probably the typical congestion that precedes pneumonia which may follow in 10 to 12 hours.

In the passive type the cause is an obstruction of the return circulation e.g. right heart dilatation, valvular heart disease, Brights disease, and chronic low grade fevers, typhus and low-grade malaria. There is hyperaemia of the lung with extreme distension of the air vesicles. Froth and blood accumulate in the air vesicles and bronchi. There is a lowered blood and lymph pressure. Congestion develops very slowly, and may take several days to come to a head marked by a gradual increase in difficulty in breathing, and as this increases there is a tendency to partial superficial cyanosis and frequently a severe hard cough with expectoration followed by consolidation of the lungs. There is a partial dullness over the lung area with feeble respiration and bronchial breathing.

TREATMENT, ACTIVE CONGESTION

The lesions found are always in connection with the lung area of the spine, 2-7T, primarily muscular and secondarily osseous and ligamentous articular lesions of the vertebrae and the corresponding ribs. The principle aim in treatment aside from the correction of the lesions is the equalisation of the circulations and the free distribution of the blood through the systematic circulation so as to prevent pulmonary stasis.

1. Patient on side, beginning at the lower C treat downwards along the spine moving the muscles upwards and outwards in relation to the spine at first lightly and then more deeply as far down as 8T. Sometimes strong inhibitory pressure will produce paroxysms of coughing, therefore inhibition is contra-indicated.

2. Relax the muscles of the neck by rotation with extension of the head and neck at the same time raising the clavicles by upward backward and downward movements of the arms. If the patient can stand it, this is best given with the patient in the sitting position.

3. Articulation of the spine downwards beginning gently and increasing the force, to assist co-ordination of breathing from the nervous aspect.

4. With the patient on the back treat the first six ribs of each side at the same time if possible, raising the ribs by pressing lightly with the fingers at the angles of the ribs and at the same time pulling the arms up over the head while the patient is inhaling. Then vibrate freely with the hands over the chest. Here the object is to expand and stretch the intercostal muscles.

5. Strong and deep vibration with the hands over the whole lung area both anteriorly and posteriorly to free and equalise the blood circulation in the lungs.

6. Make the patient take regular breathing exercise always in connection with the treatment so as to liberate and keep free the lungs, meantime vibrate upwards towards the clavicles over the anterior chest from the point of obstruction. With the knee in the interscapular area, pull the arms upwards and backwards in time with the patient's respirations, making these gradually deeper and deeper. The lung capacity of the patient may be determined by the time taken to tire the thorax during this manoeuvre.

7. Give vaso-motor treatment in the lung area 2-7T to stimulate the circulation.

8. If the patient is subject to coughing and haemorrhage, use hot dry foot packs, and heat for the haemorrhage at the appropriate centre, 11T.

9. The patient must have absolute rest in bed until the stage of recovery will allow of some exercise. He should have warm or hot drinks but no food for 24 hours.

10. Always finish each treatment with strong inhibition in the vaso-motor area, 2T-2L downwards and inhibit in the upper C, in order to leave the patient in a state of vaso-motor balance.

BRONCHO-PNEUMONIA

An inflammation of the small bronchioles. and the settlement of the deposits in the minute terminal arterioles of the air vesicles. It starts as an inflammation of the bronchus and then extends into the capillaries by the continuity of mucous membrane, finally settling in the air vesicles. The bronchial and capillary stages are vasomotor type, and the air vesicle stage, visceromotor. In all stages there is congestion and progressive inflammation, while in the third there is also paresis, i.e. a motor condition. Broncho-pneumonia occurs in children and old people when the respiratory system has been deficient. It occurs secondarily to acute bronchitis, measles, diphtheria, scarlet fever, whooping cough, influenza, and other infectious fevers; also following exposure and exhaustion. It can occur as a result of the inhalation of a foreign substance such as food, vomitus, water, or from spread of infective material from an adjacent infective focus. The lesions that are found are sub-luxations of the ribs and vertebrae 2-5T and a complex lesion of 5-6T and the associated ribs, producing or generally associated with a pulmonary vaso-motor disturbance.

The starting point of the disease is a hyper-physiological congestion and inflammation of the bronchial tubes, a disturbance of vaso-motor function.

This is followed by arterial congestion and inflammation; again this is a vaso-motor disturbance and a reaction to altered respiration, leading to capillary congestion, and thickening and enlargement of the walls of the blood vessels.

SYMPTOMS

The onset is always gradual, except in the case of trauma, and begins with lowered temperature, the physical reaction to congestion, followed by feverishness, the hyper-physiological reaction to inflammation. The respiration is accelerated, the reaction to physical changes, and breathing becomes difficult. The deposition of material in the bronchi produces the severe cough. The patient becomes exhausted, with prostration, high temperature, respiration 60 to 70, hard cough with mucous and mucopurulent expectoration, and rapid pulse. If the condition continues, there is deficiency of oxygenation, pallor of the lips and dark colour of the nails, anaemia, the patient comatose due to the excessive amount of CO² accumulating in the system. The face changes from pale to livid, followed by collapse and death.

Physical signs are those of consolidation. Fine clear rales, slightly impaired resonance, slightly dull percussion note, depression and retraction of the external cartilages.

TREATMENT

The condition to be dealt with is primarily one of pressure of obstruction resulting in secondary interference of the blood supply causing a vaso-motor paresis which by reaction produces a visceromotor paralysis.

1. Preventive treatment. The only basis on which the abortion of the attack is possible is that of vaso-motion, therefore the strongest possible vaso-motor treatment should be given in the early stages.

(a) If a small child has bronchial symptoms, keep warm and well nourished and in the open air. This may be a sequel to measles or chicken pox.

(b) Give persistent treatment in the vaso-motor area of the lungs, 3-5T.

(c) Treat carefully the muscles of the anterior thorax by vibration, raising and spreading ribs and thorax as a whole.

(d) Look particularly to the 10th cranial nerve, being best reached in connection with the bronchial tubes at the atlas and axis and along the carotid sheath.

(e) Attend to lesions of rib 1 and to 7C and 1D to prevent pressure and irritation to the inferior cervical ganglia, as all sympathetic impulses to the lungs pass through these ganglia.

(f) Free the lymphatic circulation by treatment over the anterior T.P. of the lower 3 cervical vertebrae. If the muscles are contracted in this area, give relaxation treatment.

(g) When all other conditions are cleared up give treatment to equalise pulmonary and systematic circulations, especially at 3-5T.

2. Curative treatment, after the disease has developed. Here the main object is to open up and to keep opened the vaso-motor system over the entire body.

(a) Treat the muscles downwards along the spine to relieve contracture. Adjust lesions, particularly occurring in the cervical area and the upper two thoracic vertebrae and ribs. Articulate in this area.

(b) Free and articulate ribs 2-8, raising them with the patient on the back and the fingers placed at the angles of the ribs with arm raising, upwards, backwards and downwards.

(c) Attend to the condition of the muscles on both sides of the neck, especially where these are liable to irritate the 10th cranial nerve and the sympathetic cervical ganglia, also paying attention to muscles in relation to the 1st rib and clavicle.

(d) Vibrate over the muscles on the anterior thorax and lung areas. Follow this by treatment to spread the ribs, especially the last 6 and strong articulation of the lower 6 thoracic vertebrae to affect the splanchnic nerves.

EMPHYSEMA

In this condition there is an increased amount of air in the lungs with excessive distension of the air vesicles. Air sometimes passes directly into the interlobar tissue and sometimes even into the subpleural cellular tissue where it deposits and accumulates. The pleura may become detached forming large air sacs and air may pass into the subcutaneous tissues of the neck producing the physical sign of crepitus. It occurs chiefly in the male

sex and in the old age of asthmatic and cardiac patients. There are two factors operating as causes:

1. An impaired condition of the elastic tissue of the lung, the result of lack of resistance, that is, of visceromotor origin.
2. An increased amount of air and therefore an increase of air pressure in the alveoli. This is a condition of the vesicle and also visceromotor.

The latter type is found chiefly in children with pharyngeal or nasal obstruction, and in adults whose occupation requires severe muscular strain affecting chiefly the respiratory muscles. Amongst predisposing causes are whooping cough, measles, chronic bronchitis, chronic mitral valve disease, loss of lung tissue elasticity with age. Sometimes there is an hereditary neurosis which lies dormant until middle age.

Type 1. Interlobar resulting from the rupture of the air vesicles, the air escaping into the interlobar tissues. Usually follows intense or violent coughing, e.g. after whooping or with bronchitis. Later the air may escape into the soft tissues of the neck and produces crepitus.

Type 2. In the vesicular type the alveoli are dilated, the infundibula increased in size beyond the elastic reaction. There are a number of sub types:

(a) *Atrophic* which comes on with the degeneration of old age. The chest is diminished in size and the lungs become smaller, the ribs being distorted and closely packed together. The chest muscles become intensely contracted and atrophic.

(b) *Hypertrophic*. Here the dilation of the air vesicle is caused by and compensatory to tissue structure derangement. There is increased anterior posterior diameter of the thorax, the ribs being in the position almost of full inspiration with consequent reduced respiratory movement.

(c) There is a *compensatory type* when a portion of the lung becomes disabled and the rest of the lung has to function for the whole, e.g. in tuberculosis. At first the walls of the alveoli are stretched and there is simply a physiological compensation, but later as distension produces loss of elasticity vesicle function is lost and the condition becomes emphysematous.

PATHOLOGY

1. The collapse of the thorax which becomes barrel shaped.
2. This causes the lung to enlarge, preventing complete expansion and contraction. These two stages are hyper-physiological.
3. Following this in some cases there is a puncture of the thorax due to the loss of elasticity, the lung becomes pale and soft, the vesicular walls atrophy. There is lessened elasticity, capillary degeneration and fatty degeneration of the air cells.
4. If the condition continues, there follows thickening of the epithelium of the bronchial walls, a lowering of the diaphragm and a general hyper-physiological degeneration of all the organs of the body.

SYMPTOMS

The onset is gradual in connection with three typical symptoms:

1. Dyspnoea. Shortness of breath due to simple obstruction of the respiratory apparatus.
2. Cough in connection with the slightest exertion, the lungs being overfilled with air and CO², producing wheezing and harsh expiration.
3. Cyanosis occurs the result of excess CO² the chest becomes rounded and bulging at the sternum. There is a separation of the ribs with widening of the interspaces, raising of the clavicle. hardening of the muscles of the neck, lessening of the vocal fremitus. The apex impulse is located over the enciform cartilage because the heart is displaced to the right, there is enlargement of the right ventricle. Tympanic sounds are present, inspiration is short and feeble, expiration is prolonged and with bronchial rales.

PALLIATIVE TREATMENT

Keep the patient in fresh air. Raise and expand the chest, relax the muscle along the anterior neck, shoulders and interscapula area. See that the upper T especially 3-6T is kept relaxed and articulate the vertebrae and ribs. It is important to keep the 5th ribs free to check asthmatic complications.

GENERAL TREATMENT

Try to keep up the co-ordinate movements of lungs and thorax by lifting movements without arm leverage. Stimulate the 10th cranial by articulating atlas and axis. Articulate 2-7T to prevent circulatory stasis.

In the hypertrophic type there is distortion of the thorax and lowering of the diaphragm and it is necessary to correct lesions in the thorax at 1-2T and 1st rib and upper T spine and attempt to restore thoracic abdominal and pelvic movement. In cases that have not become chronic relieve by direct treatment to the nerves of lung and thorax, i.e. 10th cranial at 1-2C, the C and T symptoms, i.e. the vasomotors, and the phrenic and spinal accessory nerves in the lower C areas. With the patient in the sitting position give the interscapular knee treatment. In time with expiration, give compression to the thorax followed by strong and deep vibration over the thorax to increase expiratory activity. Diet to be light and nutritious with a minimum of carbohydrate and fat, in very severe cases pre-digested food should be given.

APPLIED PHYSIOLOGY

J. M. LITTLEJOHN

The foundation of Applied Physiology is living anatomy, that is, the anatomy of the body in its entirety with the parts correlated to one another to operate as a single organism. Hence the underlying principles are:

1. *The Unity of Life.* Without attempting to define "Life" we may speak of it as the single principle which unites together all the separate functional activities and makes them operate and co-operate to establish unity within the organism.

2. *The Functional Capacity and Activity of their own which belongs to the separate parts of the body including all the organs.* This may be called the vital process as distinct from the vital force of the body as a whole. Each process is a unity in itself but all the processes function together to establish unity of the whole.

3. *Unity is based on the Nervous System.* The Nervous System stands pre-eminent in the field of Applied Physiology. This is because the multiplicity of vital processes is based on it. In the nervous system we find a centralising force and, at the same time, distributing forces. The former travels upwards along the nerve paths towards the brain as its centre, the latter travels downwards along other nerve paths for the purpose of distributing energy to all the separate fields of the vital processes,

4. *The Preservation of Life.* It is implicit in the Applied Anatomy and Physiology of the living body that Life is continuous and there must therefore be means for its preservation. In the wide sense this preservation depends upon nutrition. Nutrition may be regarded as resting on two foundations. (a) The blood as the medium for the distribution of appropriate materials for the upbuilding of the separate tissues and structures. These materials are in turn supplied to the blood by certain organs which are concerned with digestion and secretion. Waste elements must be eliminated to prevent the fields and pathways of nutrient distribution from being poisoned. This is done by the detoxinating glands and organs. (b) The nervous system, the controlling function of which must be maintained if nutrition is to be perfect.

There are two special functions of the nervous system in connection with nutrition. The first is the *tonic* function which by the distribution of appropriate energy to the structures of the body maintains the tone of every

one of them and at the same time establishes tonic co-operation which is the basis of the appropriate stimulation of the nervous system itself. In this way the nervous system becomes familiar with all the needs of the various parts of the body. This explains the reason for the localisation of the area centres in the brain, medulla and basal ganglia as well as in such structures as the retina of the eye, the semi-circular canals of the ear and the solar plexus as the abdominal brain. These may be regarded in the light of applied physiology as registers of the varying conditions in the different parts of the body. The second is the *trophic* function. Not only does the nervous system contribute energy and localise and register the needs of the different parts; it also supplies a certain element in the assimilative processes. This is furnished by the nerve fluid which we call the cerebro-spinal fluid, which is in reality a secretion prepared in and furnished by the nervous system itself. This highly refined and perfect nutritive substance arising from the serous and mucous membrane parts of the brain structure (arachnoid) is in one sense an excretion from the brain, but it is also a secretion furnished to all the rest of the body to promote perfect nutritive conditions.

5. All disease conditions in the body are founded upon and centred around the blood and the nervous system. Disease is disorder which implies disorganisation of some or all of the processes essential to keeping the body alive and in a state of perfect nutrition. Normally the blood and nervous systems are regulated in the realm of distribution by the mechanics of the structures of the body. Hence, any variation in the structural relations of the different parts of the body which interferes with the proper distribution of blood, nervous energy or nerve fluid represents disease, disorder or disorganisation. It is on this foundation and on what we call a "lesion" that we osteopaths build our theory of disease. Therefore, a lesion may be defined as any deviation from normal in the structural relations or relation of part to part, structure to structure, organ to organ or function to function within the organism.

It is important to note the relationship of a lesion to disease. Wherever there is disease and it is localised, although it may be constitutional rather than local in origin, this disease exhibits the following features:

1. It manifests itself by symptoms and physical signs. These are simply manifestations in the physiological functionings of the patient and we must remember that they are simply signs of variation from normal.

2. Behind these altered functionings there is always some cause and this is always traceable to (a) some origin in the supply field or (b) some point along the nerve transmission or blood distribution pathways. For example, in disease of the lungs or heart the predisposing cause is traceable to the upper dorsal spine or the ribs; in sciatica it is either in the sacro-iliac articulation or in the field of the lower lumbar vertebrae.

3. This brings out the point that ultimately the real lesion has some relation to the bone structures, because the bony framework is the foundation of body structure and all tissues are attached or related to it. The bones thus represent articulation and junction of the entire soft tissue system anatomically, and the foundation of every movement is based on irritability, contractility and elasticity of tissue mechanically. When the body is operating as an organism there is a unity in all its activities if it is normal; but, if it is abnormal, some one particular part of the organism drags on the rest and the result is pain. Here pain is the expression of a localised disturbance, and as soon as the disturbance exists, it begins to modify local function. In the next stage, if the disturbance continues, there is a reaction of other functions and it should be noted that the reaction always takes place through the distribution of the nerve field, passing either towards the centre or the periphery.

These points are illustrated by the following cases.

CASE 1. A girl of two suddenly attacked by constipation followed by intense pains tending to localise in the appendix area. The history showed that the child had slipped from the piano stool on to the floor causing bad pain in the lower back which had quickly passed off. A few weeks later the abdominal pains appeared. Examination revealed that there was upward slipping of the right innominate with dragging across the pelvis and rigidity of the left hip. The result had been a reaction on the rectal field through the sacral nerves with rigidity of the rectum and semi-tetanic sphincters. Secondary results were indigestion and feverishness, headache and no sleep. These reactions in turn produced secondary lesions, viz D5 and 6, posterior. This took place through the sympathetic system, that is from the sacral nerve field into the sympathetic nerve field, backward to the 10th Cr. nerve and solar plexus and from thence viscerally to the stomach, thoracic organs and brain.

CASE 2. A girl six years old fell down stairs and two days later began to swing the right leg in a peculiar way, as if it was partially dislocated. Examination showed upward slipping of the right innominate and in

addition muscular tension from the sacrum around and over the right hip, so severe that the hip was twisted and difficult to articulate. Muscular rigidity inhibiting the sacral nerves produced constipation. A final symptom was a slight attack of acute appendicitis, the reaction passing in this case to the appendix rather than up along the spine via the sympathetic system because there was profound congestion of the circulation from the trunk to the right leg. Treatment consisted of (a) relaxation of muscular rigidity from above, i.e. trunk down into legs, (b) correction of the right innominate and articulation of the sacro-iliac in connection with flexion and rotation of the leg, and (c) extension of the right leg by strong traction. Six treatments only were sufficient.

CASE 3. A young man of 25 suffered from asthma for four years following immediately on a fall from a cart onto his head and right shoulder. Examination showed D5 markedly posterior and lateral to the right, and the 5th rib on the right torn loose at the costal articulation. Secondary lesions included a rotation of D9 with a history of indigestion accompanied by gas formation in the stomach and colon with constipation. Also, D3 and 5th rib lesions which are typical of asthma with the effect operating through the 10th Cr. nerve. D3 and 5 and the corresponding ribs represent a motor function in connection with the 10th Cr. because here you have a connection with the 11th Cr.

This means that the asthma in this case is a visceromotor condition. D9 is the individual vertebra working alone between the dorsal and dorso-lumbar curves and the lesion here combined with the posterior and right lateral D5 practically broke the dorsal curve in two so that the area from D5 to D9 stood alone structurally and also operated alone functionally. The irritation would not travel down further than D9 and therefore the gastric and intestinal symptoms must be regarded also as motor in character, a modified peristaltic action. After the correction of lesions which was done by correcting D9 first and then D5 the entire trouble disappeared. Thirteen treatments were given.

CASE 4. A man of 42 fell upstairs injuring the entire upper dorsal area. In two weeks asthma developed. After two weeks more X-ray showed distinct separation between D4 and 5. In the next two weeks palpitation of the heart and gastric indigestion developed. The D4 and 5 condition was corrected during the next two weeks and a week later the asthma disappeared but left the heart and stomach conditions. Closer examination showed the 6th rib on the left side distinctly tilted upwards and against the

5th. During the next two weeks this lesion was corrected and over a short period all troubles cleared up. Twenty-five treatments were given.

The nature of the osteopathic lesion as illustrated by these cases exhibits certain features.

1. There is some perversion in articular functioning either in the bones or the soft tissues. For instance, in 100 cases of pneumonia treated osteopathically (of which one died), the real lesion was traced to some condition of the ribs interfering with their articulability. Ten of the cases were preceded by asthmatic bronchitis from the rib rigidity; thirty had a history of disordered diaphragmatic breathing from the side of phrenic nerve distribution; fifty had some form of injury as a predisposing cause, with the spine as the centre of irritation; in the remaining ten the pneumonia developed from some catarrhal condition. With regard to the pneumococci spoken of as the infective origin of pneumonia, in 75% of healthy individuals in the winter the pneumococcus is present in some part of the respiratory tract. In the cases analysed above the pneumococcus would be an exciting cause working on a point of lowered resistance.

2. In cases of injury (such as Case 4) there can be development of infection representing a condition of lowered resistance. It should be noted that D4 and 5 are specially associated osteopathically with lowered resistance and the frequency of lesions here explains why lungs and heart are so often involved in injury cases.

3. In asthmatic cases there is probably always some condition of strain either in the dorsal spine or the middle ribs. Hence, we find in the analysis of 157 cases of different types of asthma that there was muscle spasm in the dorsal area on superficial examination and definite tenderness along the vertebral column especially in the middle dorsal region. This tenderness seems to graduate downwards along the spine and is frequently associated with lumbago in the male and pelvic trouble in the female. Any condition localised below D4 tends to gravitate downwards, but a condition localised above D4 tends to move upwards towards the head.

In connection with lesions of L2 and 3, it should be noted that the effects of L3 lesions tend to gravitate downwards towards the pelvis and lower extremities, while the effect of L2 lesions is never lower than the kidney and concerns the circulation into the kidney and not the circulation out of it. In general, structural mal-adjustments can be found anywhere in the body in secondary conditions, but the two most common lesion fields are the upper half of the dorsal region and the lumbo-sacral area. These

conditions are associated with vaso-motor disturbance because the upper half of the dorsal area controls the “sympathetic brain” (three cervical ganglia) and at the same time affects the aortic plexus which is the governing factor in the arterial circulation. In any kind of acute case we can always relax the upper dorsal (even if the patient is very ill) and thus regulate the entire aortic circulation of the body through the aortic plexus. If the muscles are rigid, inhibit and then gently manipulate on both sides of the spine. If there is visceromotor disturbance this operates through the viscerodilator function of the sacral nerves. This explains why the only way to deal with the condition is to appeal to the motor side of the nervous system. There are two ways of doing this: (1) articulation of the lumbosacral and innominate joints and (2) articulation of the hips. This applies in all cases of pelvic congestion and inflammation, such as gynaecological cases, which demand articulation from the dorso-lumbar region downwards and rotation of the limbs. In localised conditions involving the visceral organs always look for aggravated soft tissue lesions along the sides of the spinous processes. A further case may here be mentioned as an illustration:

CASE 5. A patient was apparently suffering from gall stones though the X-rays were negative. Intense pain developed in the right upper quadrant of the abdomen. On examination, it was found that the pressure at the tip of the 12th rib produced radiating pain in semi-circles towards the umbilical area and that there was a rotation at the head of the 7th rib. The case was kept relieved by treatment for several weeks, the treatment consisting of relaxation of the soft tissues round the heads of ribs 6 to 8 with articulation of rib 7 and also of the spine from D7 to 12. After three weeks the patient suddenly collapsed with terrific pain and operation revealed twelve large gall stones and four calcified glands in the region of the bladder.

The stones were removed by incision with subsequent stitching. Afterwards further osteopathic treatment was given and a perfect result obtained.

These various cases have been cited to give a clear index of what we mean by an osteopathic lesion. First, it implies a variation from the normal in the physiological functioning of some part or parts of the organism. Secondly it implies some anatomical change in the articular field. This is to say, that the foundation of every lesion is some disturbance in the correlation of structure with structure and implies modified mobility. It follows therefore that every lesion is a modification of the organism and not simply of the

mechanism of the body. We must emphasise this because the organism is self-reparative and so when we speak of finding and removing obstruction we are simply preparing the ground for the exercise of the reparative function of the organism. It should also be noted that the body is in perfect state when it is in a condition of constant change. All changes in the organism are rhythmic, therefore a static condition of the organism is impossible. This constant change in the organism makes it possible for a lesion to exist. Normally the body contains all the forces and resources required for growth and repair, but in pathological conditions these forces and resources are blocked or obstructed. This stoppage may take place in the cell. Each cell of the body, like the amoeba, has in it all that is necessary for reconstruction. The cell is thus the physical foundation of the body and the units of structure. The stoppage may take place in a tissue or organ, these being simply combinations of cells. The combination, it should be noted, takes place on the basis of a chemical co-ordination and physiological co-operation but these in turn depend upon proper nutrition through the operation of the blood and nervous system. If these are cut off then all chemical co-ordination is stopped or is inadequate for the needs of the organism. Or again, this stoppage or obstruction may take place in sections of the body structure which exist for the purpose of carrying on the important functional activities. These are the parts where the body reacts to all its different sections as well as to its environment and if they do not function because their blood and nerve supplies are obstructed, life is impossible. In fact the fundamental characteristics of the organism are such that it functions normally only so long as there is no obstruction. The osteopathic lesion represents a disturbance in one of these three fields and is essentially a blockage which stops growth development or repair. This is the basis and the only basis of disease.

The spinal column is the real foundation on which healthy, normal equilibrium is built, and the disturbances that produce disease centre in the same field because it is the only part of the body structure in which we find the principle of segmentation (distribution). Each segment of the spine represents a section or a part of a section of the body. This is the biological foundation of the unity and co-ordinating activity of the body and its parts and hence also of the production and effects of vertebral lesions. Sometimes, indeed, there is a disturbance outside of the spine, but it must centre in the spine before it disturbs the body. These secondary conditions are always to be regarded as irritations which express themselves through some spinal field. This is a fundamental of Applied Physiology and in the

discussion of lesions from this standpoint we must remember that the body is not merely a mechanical, physical or chemical unit but is a unit of biological life. Biology says "the human body does not receive the impulses of life like a machine, but each single atom of the different organs carries within itself its vitalising power." This means that the body so far as its life is concerned is a series of inter-relations, all of which are controlled by the nervous system, and the starting point of every activity in the body is an afferent impulse. Hence we lay down the proposition "Anything that affects or interferes with the afferent impulse, more or less impairs the system or a part of it. The interference is a blockage."

We must also remember that the relation of the nervous system to the body as a unit is to be regarded as being one of control of activity or functioning. Therefore whether the process is physical or mental, or both, whether it is a minor tissue growth or a lesser type of repair than normal, there is always a spinal cord reflex involved and the afferent impulse is always the starting point of the activity, normal or otherwise. Every part of the body contributes its quota to these afferent impulses and the sum of them represents vitality. Starling says: "*Every vital phenomenon is a reaction conditioned by some change in the environment of the animal and adapted to its preservation. The object of the nervous system is to ensure the co-operation of the entire organism in any reaction to its surroundings and itself*" This means that in the growth and repair of the cells, tissues and organs, no part is isolated and every part is subject to peripheral sensory stimulation; that is to say, that a centre does not originate impulses but depends on impulses entering into or passing through it, and the body acts as a whole, not automatically, but in response to sensory stimulation. From this it follows that the quality and quantity of the blood and the character of the nerve stimulus determine all changes. Therefore, an obstruction to the circulation or the nerve impulse strikes at the very foundation of the true integrity of the body, and so we define a lesion as any structural perversion which, by pressure or otherwise, disturbs functional activity and causes disease.

THE EYE

J. M. LITTLEJOHN

The eye is an organ with the special function of vision and yet it is so involved in the structure and function of the body that any and every body condition may be expressed through and in the iris, the retina and the pupil. In its relation to the nervous system it has a special cranial nerve, but it also depends for its nutrition, its movements and the balance of the two eyes in vision on the action and the coordinating function of the greater part of the central and sympathetic nervous system. This makes it impossible to deal with the eye as an isolated organ or to consider the eye diseases apart from their relation through the nervous system to the rest of the body. It would be true to state that except for purely structural deficiencies or alterations in the eye as an organ, every eye disease has its origin in some other part of the body.

The examination of the eyes must be made from both subjective and objective standpoints. The former includes the patient's history and symptoms: whilst he is speaking, note any irregularity of size, position or direction of the eyes. Have the patient seated with his back to a source of light, for example a window and with the head inclined slightly backwards. The eyes should be fixed on a small mirror or bright object two or three feet away. Observe any difference in intentness or in angle of vision. Irregularities of movement of one or both eyes may be seen if the mirror is shifted from side to side or up and down taking the eyes to their full range of movement. With the eyes still fixing the object now held in the mid line cover one of the eyes with the hand or a card. If the other eye has been fixing the object correctly it will not move, but if it has been deviating outwards it will now move in slightly; if the deviation was inwards it will move outwards in order to fix the object. On removal of the hand similar movements of the hitherto covered eye will reveal like deviations.

Examine the eyelids to find out if the margins are normal, and note the condition of the cilia and conjunctiva. To examine the lower half of the lid or eye, pull the eyelid down at its centre and then apply traction at the inner and outer canthi, noting whether the eyeball or lid move uniformly or not. If there is resistance to traction at the canthi, this denotes an impediment to mobility, inequality or unbalance in the nervous control of the movements of the eye. To exert the upper lid for examination, take the cilia between finger and thumb, draw the lid away from the eye and lift

upwards, meantime preventing the tarsal cartilage from moving upwards with it. Examine the cornea for transparency, inflammation or ulceration, which is found generally in small patches. This is best done by the method of oblique illumination where the rays of light from a lamp are brought to a focus on the part of the eye under examination by a lens of about one inch focal length; opacities will appear white. Observe if the pupils are equal in size and test their reaction to light, direct and consensual, and to accommodation.

In some cases it is necessary to test the range of vision. A simple method of doing this is to have the patient seated with his eyes about fifteen inches from a blackboard or paper, and fixed on a mark on the board. Cover one eye, and test the other by bringing a conspicuous object such as a piece of white chalk inwards towards the mark from various directions, marking on the board the point at which the object is first seen. Repeat with the other eye. By having the eyes follow the object it is possible in a similar way to map out circles of vision in order to assess the function of the extrinsic ocular muscles.

Objectively, defects may occur in the following ocular functions. In the normal eye, rays of light focus on the retina so that, whether the object be far or near, the eye itself has the power of regulating its focal point, i.e. accommodation in vision is a physical condition regulated and controlled by the eye via the nervous system. This power of accommodation is always more or less deficient in every eye and is usually found in connection with the ciliary muscle of the eye and results in an interference of some kind with the movements of the lens. When divergent rays of light from a near object enter the eye, they require more refraction than the parallel rays from a distant object, in order to focus on the retina. To do this the ciliary muscles must contract resulting in the lens becoming more spherical and focussing the rays of light on the retina. Any variation in ciliary muscle action will modify the focussing power of the eye hence in accommodation defects simply to correct the vision optically perpetuates the abnormal condition of the ciliary muscle. This can only be corrected via the nervous system.

There may be abnormal refraction taking place as the rays pass from areas of varying optical density, i.e. from the air through the cornea aqueous, lens and vitreous humour; any variation in curvature between these media will affect the refractive power of the eye. This is a physical

condition, but still depends upon accommodation and nervous system control.

The antero-posterior diameter must be normal if vision is to be normal. If the diameter is too great, the rays will focus in front of the retina; if too small, the rays will not focus at all. This produces confusion of vision, artificial objects of vision, or sometimes blindness. The media of refraction must be clear, the solidification of the fluids of the eye produce films or growths which will affect the transmission of light.

If the condition of the eye is normal it is said to be metropic. Any deviation from this physical condition is represented by a particular variation, e.g. in hypermetropia the antero-posterior diameter is too small and it is not possible for the eye to focus rays of light coming from a distant object, i.e. which are parallel. Since the ciliary muscle contracts in order to relax the capsule of the lens and so increase its convexity the muscle becomes over-strained and eye headaches result.

Myopia results when the antero-posterior diameter is too great and the rays of light focus in front of the retina. Other possible causes are too great convexity of the cornea or poor physical relaxation of the ciliary muscle. This condition can be congenital because all eyes at birth are blind and at first vision is to some degree myopic because of the inability of the eye to rectify the rigidity of cornea and sclerotic, which is essentially present in an eye that has never functioned in vision or that has largely ceased to function by habit or other reason. This condition may be acquired principally in connection with paralysis of the ciliary muscle, muscular inactivity largely developed by non-use, or in intra-orbital conditions involving the tissues of the eye, or in constitutional disturbances such as rheumatism when toxins cause loss of tonicity in the eye muscles and tissues. In myopia therefore the eye is unable distinctly to see distant objects, and if an attempt is made continually to accommodate the eye to distant vision, the result is headache and further blurring of the vision.

In astigmatism there is structural derangement of the eye, the curvature of the cornea, lens or retina is irregular, hence the focus is not even over the visual field. The diagnosis of this condition is based on an examination of the axes or axial planes of the eye in relation to the axial plane of the optic disc. Symptomatically, there is headache, inability to use the eyes with concentration for any time, especially in near vision. Since symptoms are most pronounced when the subject is concentrating his vision on a particular object, e.g. a book, it is conceivable that this indicates

astigmatism to be a functional rather than a structural condition in origin, that is, the primary cause is an inequality in the contractibility of the ciliary or extrinsic muscles of the eye, possibly due to toxic substances affecting muscular balance. If this be so, astigmatism would be more easily corrected osteopathically than would myopia or hypermetropia.

Presbyopia is the senile condition of the eye in which there is inability to see objects either near or distant due to loss of elasticity of the ciliary muscle and of the eye itself organically. Note that if the eye is kept and used in normal activity, the muscles will, by their activity maintain the elasticity of the lens. This is important in cataract, as the solidification of the lens would be impossible if the muscles of the eyes play their normal part. Hence in all conditions relating to the lens, the eye should be kept in a state of activity and should not be shaded.

Diseases of the eye are the result of anatomical or physiological modifications, the significant points of lesion being the upper and middle cervical in relation to the function of the eye as an organ and the upper thoracic spine, in vaso-motor control. The lesion may be in muscle, joint or both, the muscle in relation to the sympathetic or constrictor function, and the latter relates to the central nervous system, or dilator function of the eye. In some cases the entire cervical spine is affected, being the region of reaction from other parts of the body. One point that must be noted from the standpoint of treatment is that nothing can be accomplished by treating only the cervical region. If lesions are corrected in the cervical area only, this will not affect the vision, and it is necessary to go to the field of cause which produced the reaction in the cervical region. Sometimes there are individual lesions of a cervical vertebra, or of the superior maxillary, first rib or clavicle, especially where a single eye is involved. Another common lesion involves the whole cervical area laterally with intense hyper-trophic contraction of the muscles on one side and associated with upper thoracic lesions. In some cases the fifth cranial nerve is involved, e.g. in motor derangements of vision such as diplopia and strabismus where eyestrain is the exciting cause; lesions being found at 3C and 2 and 3T chiefly. In axis lesions the lymphatics are involved and the eye suffers from enlargement, excessive swelling and fluid accumulation.

In vascular lesions of the eye there is a direct impingement on the vertebral arteries with disturbances of the vaso-motor nerves of the lymphatics. In such cases the lower two cervical vertebrae and clavicular lesions obstruct the lymph flow from the head. Lesions of the atlas, axis

and 3rd cervical affect the superior cervical ganglion which is the sensory head of the ascending sympathetic chain and sends branches via the carotid arteries and the cavernous plexus to the head and eyes, also sending fibres directly to the eyeball and via the ophthalmic arteries to the eye. The ciliary ganglion, a very important structure in relation to the eye, lies just behind the orbit, between the trunk of the optic nerve and the external rectus muscle of the eye. Hence any abnormal pressure on the eye backward into the socket, by enlargement, dilatation, increased intra-orbital tissue such as fat posterior to the eyeball will affect the ganglion directly. This ganglion has direct sympathetic connection with the 3rd and 5th cranial nerves, and it represents the regional sensory motor and sympathetic fibres of the eye, in the same sense as the term is applied to the spine, where nerves pass from the regional centres for distribution. It is this ganglion that is affected in treatment when the eyeball is pressed backwards into the orbit, the direct pressure on the ciliary ganglion may be inhibitory or stimulatory according to circumstances.

The 3rd cranial nerve supplies all the extrinsic muscles of the eye except the superior oblique and the external rectus muscles, and also the sphincter muscle of the iris. The important nerve centre controlling the function of the latter is the superior cervical ganglion, and sympathetic types of lesion tend to produce strabismus which is a condition of motor disturbance. A typical example of this type of lesion is found where there is a fullness of the muscles and soft tissues on one side of the neck often with intense contractions on the other side. Pressure on these contracted muscles will cause pain in the eye, particularly when applied at the level 2 to 4C.

Diseases such as conjunctivitis, glaucoma, cataract and cases of structural changes such as pterigium classify as nutritional disturbances, produced by over-stimulation of the vaso-dilator nerve fibres being carried to the point of inhibition. Dilator fibres to the eye always act in connection to the 3rd cranial nerve transmitted along the anterior roots of the upper thoracic nerves to the eye.

In eye disease, different types of lesion may be found, for example the vascular type, operating by direct impingement on the vertebral arteries; by disturbance of the vaso-motor nerves by lesions of the upper thoracic spinal area, 2 to 4T; of the lymphatics with lesions at 6 and 7C and 1 and 2T, also of the clavicles, causing obstruction of lymph flow to and from the head.

The sensory type of lesion occurs when the superior cervical ganglion is affected through lesions of the atlas, axis and 3rd C. The ascending sympathetic chain sends branches out to the eye in connection with the cavernous and carotid plexus, filaments being sent to the eyeball and ophthalmic arteries.

Affections of the ciliary ganglion cause muscular and motor lesions in connection with the sympathetic nervous system affecting in particular the coordination of muscle control. Hence muscle control in the eye is not a brain function but an inherent and automatic one and this is the reason why lesions affecting the sympathetic system so seriously disturb eye muscle action. The sympathetics reach the eye through the cervical sympathetics, the optic branch of the 5th cranial nerve and via the long ciliary fibres. In defective accommodation and in eye strain there are lesions in the cervical and upper thoracic regions because of the irritated condition of the cervical sympathetic ganglia and of the 5th cranial nerve in its final facial distribution, and of the ciliary fibres. The ciliary ganglion is controlled through the cilio-spinal centre which is located in the lower C and upper T regions, the fibres in connection with the centre extending from 4 C to 4T.

Motor fibres to the involuntary muscles of the eye and eyelids pass out from the upper five thoracic nerves to form part of the cilio-spinal system. The retinal fibres pass out from the sympathetic system, through the superior cervical ganglion, thence to the Gasserian ganglion. there establishing connection with the cranial branches of the 6th cranial nerve, passing to the eye with the other fibres from the Gasserian ganglion. Stimulation of the cervical sympathetics produces constriction of the retinal arteries, whereas stimulation of the thoracic sympathetics (at the heads of the ribs) produces dilatation. The cilio-spinal function therefore has reference to constriction, dilatation and the balance of the two, i.e. the rhythmic tone of the eye via retina and pupil, and the coordinated activities of the eye as an organ. Hence all these functions are centred in the cervical and thoracic areas of the spine, namely 4C to 4T, 4C to 7C (constriction) operating with and under the stimulus of the superior cervical ganglion and 1 to 4T (dilatation) also of the sympathetic ganglia at the heads of the corresponding ribs. It is important to note that the sympathetic system is the medium of stimulation in the cervical spine of constriction and in the thoracic spine, of dilation, in explaining the seemingly contradictory results obtained by the articulation of the cervical and thoracic regions.

The determination of the result so far as the treatment of eye diseases is concerned is not solely from the sympathetic side. If stimulation is applied to the sympathetic chain, it is necessary to determine whether its result is constrictor or dilator. The sympathetic system is an inherent and automatic regulator of organic functional activity, and treatments applied to it, whether stimulatory or inhibitory can be used by it to normalise any particular abnormal condition. The vaso-motor system is the factor which determines whether sympathetic effect is dilator or constrictor and relates the general circulation to the specific blood supply to the eye. The primary disturbance may have its origin in one of the special nerves, such as the optic nerve, the 3rd, 4th, 5th, 6th, 7th or 10th cranial nerves, but the effects of this can only be closely associated with the eye so as to cause disease if the effect is transmitted to the eye via the sympathetic nervous system. Hence, palliative treatment is directed to normalising vaso-motor and sympathetic control.

In vaso-motor disturbances of the eye, such as retinitis, lesions will occur in the cervical and thoracic areas. If in the cervical spine the condition is brought out through its effect on the 5th cranial nerve; if thoracic, the cause may lie in the abdominal viscera, one of the organs providing an exciting cause. The trigeminal nerve sends branches to the eye through the sympathetics, the cavernous plexus providing vaso-motor and trophic fibres. Hence inhibition of the 5th cranial nerve, if maintained by a lesion condition will later produce ulceration because of nutritive obstruction in the eyeball, lachrymal glands and conjunctiva. Such lesions are commonly of the maxilla or atlas, but may also be found in the upper C and upper T regions of the spine in connection with the cervical spinal nerves which send branches upwards to the eye and the sympathetic connections of the superior cervical ganglion.

Control of pupillary contraction is through the inferior cervical ganglion in connection with the sympathetic nerves from 7C and 1T. Pupillary dilatation is also a function of the ganglion, but in this case it acts in conjunction with the spinal nerves from 6-7C and 1-3T. The action of these spinal nerves upon the ganglion is to inhibit its normal constrictor function. If the sympathetic nervous system is normal, control of pupil dilatation remains under the control of the upper thoracic spinal nerves, but when normal integrity is lost, the lower cervical spinal nerves take over this function. The 5th cranial nerve in relation to the eye, functions only through the sympathetic nervous system, in particular through the superior

cervical ganglion, hence the eye in its relation to the trigeminal nerve depends on the integrity of the sympathetic ganglia.

The constrictor fibres in connection with the retinal arteries arise from the sympathetic chain in the cervical area, and the dilator fibres pass from the thoracic sympathetic chain, both of these series being relayed through the superior cervical ganglion. Thus, constriction and dilatation, visceromotion, and cranial nerve activity in relation to the eye and its function derive from the sympathetic system and is affected by the reactions of the various plexuses within the body. Hence lesion conditions corresponding with thoracic and abdominal organs produce reflex effects on the eye through the sympathetic nervous system. If such a condition is of long standing, it produces an alteration of blood pressure in the eye, and eventually this extends to other structures contributing to the function of the eye, the 5th cranial nerve being the main medium of transmission.

General eye diseases are all reactions to change in the normal structure or function of the eye, or violations of the principles that govern its relation to the other organs of the body. It is necessary to have a thorough knowledge of the anatomy and physiology of the eye, and a knowledge of the common nose, ear, cerebral and systemic diseases that are associated with the functioning of the eyes. In these general conditions it is essential to trace out the relation of the eye trouble and the form it assumes in relation to associated disease as the primary cause.

Orbital inflammation is caused primarily by sinusitis, generally as a result of a thrombus forming in one or more of the perforating veins linking the ethmoidal sinus with the orbit, or the antrum with the lachrymal duct. Although there is continuity of the nasal mucous membrane with the conjunctiva, and although the bone separating the sinus from the orbit is very thin, these are not usually the route of interference with the eye from sinus or antrum. Thus the starting point is of venous origin and external to the eye, the first reaction being tears or an excess of lymph, due to obstruction first on the venous side, then on the lymphatic. Palliative treatment should therefore be directed to the venous circulation outside the eye and stimulation of the lymphatics in head, face and neck areas.

If the maxillary sinus is responsible for the orbital disease the major symptom is pain because there is a periostitis which may lead to necrosis of the bone. This is also due to venous obstruction which affects the periosteum, and it will produce oedema of the lower eyelid and injection

and fluid stasis in the lower half of the conjunctiva. Palliative treatment consists of improving the lymph drainage, and inhibition around and over the orbit to relieve the pain and to drain the excess of blood downwards by steady inhibition from the external canthus to the angle of the jaw. If this condition becomes extreme, the eyeball becomes displaced upwards in the orbit with the resultant diplopia. To relieve this pressure should be applied over the bone just lateral to the external canthus and continued until pain is transferred from the point of pressure into the eyeball. As soon as this pain in the eye is felt by the patient, convert the inhibition into stimulation by a circular moving pressure, progressing outwards and downwards until the eye begins to move then, while continuing this, press the eyeball backwards and downwards into the orbit. If osteomyelitis develops, the inner part of the orbital floor becomes the centre of a dropsical effusion which may continue to the point of pus development and sloughing. The orbit should be irrigated daily with a saturated solution of Epsom Salts following the above treatment. In all cases general circulatory treatment should also be given.

Frontal sinus infection may extend into the eye producing a tender fluctuating swelling at the upper inner angle of the orbit with oedema of the upper eyelid and displacement of the eyeball downwards in the orbit. This is found chiefly in cases of tuberculosis and always associated with osteomyelitis. Sometimes there is a fistula into the frontal sinus. In such cases the appropriate surgical drainage should be used, but the irrigation and local eye treatment as described above also general circulatory treatment should be given.

The most common sinusitis in relation to the eye comes from the ethmoidal sinus via the anterior ethmoidal vein, and produces oedema of the medial halves of both eyelids, injection of the medial conjunctiva with lateral displacement of the eyeball. In some cases the posterior ethmoidal vein is the channel of infection, when exophthalmos may occur. The treatment again is similar, but only very gentle pressure should be given over the eyeball, and irrigation given frequently instead of daily. The eye should be kept cool by application of a mild ice poultice, cold milk or cold thymol of glycerine. Sphenoidal infection sometimes affects the orbit, but occurs always secondary to posterior ethmoidal vein involvement. Drainage treatment with inhibitory and tapping pressure over the sinuses should be given as frequently as possible, followed by the circulatory drainage treatment from the eye downwards along the side of the face towards the neck and spine. The posterior ethmoid and the sphenoid, on

account of the anatomical relation of the intervening spaces and the optic nerve are the sinuses to which optic nerve involvement can always be traced, the origin of the inflammation being generally in the nose. Polypoid degeneration and consolidation of oedematous material are the chief primary conditions occurring at any point in the head, neck, throat and upper thorax, but the main source of infection is always in the sphenoid or posterior ethmoidal vein. The condition is therefore primarily venous, and the line of treatment should be to try to eliminate venous stasis around the head, neck and throat, followed by general circulatory treatment away from the head, directing the blood chiefly into the abdomen using lymphatic pump and spinal treatment.

In iritis there is a combination of conditions involving the iris, the choroid, and the retina, all being secondary to a chronic sinusitis. If cataract appears as a secondary complication, the establishment of drainage must be followed by the clearing of accumulated inflammatory material, so treat to establish the circulation to, through and from the eye, and follow this by general circulatory treatment.

The two prominent symptoms of asthenopia are headache and ocular fatigue with dizziness resulting from the latter. In some cases, especially in the growing child, paroxysmal squint frequently accompanies the fatigue. This is generally caused by the absorption of poison into the eye from the sinuses through the blood stream, and produces its effects through the static condition of the circulation in the eye. The task here therefore is to loosen the eye and all the orbital structures and to establish drainage by inhibition followed by rhythmic treatment at the internal canthus and from the external canthus to the angle of the jaw. Complete by general stimulation of blood and lymph circulations.

As far as the eye is concerned, the symptoms of increased intracranial pressure are similar, whether due to brain tumour, abscess, meningitis, or any kind of irritation producing a reaction through the brain. The pressure produces papilloedema in practically every case of tumour of the cerebellum, midbrain and optic thalamus. In tumours of the anterior central area of the brain there is always an optic neuritis but this is seldom so if the tumour lies in the optic tract: instead there is optic atrophy. There is almost always some systemic disease in the background, symptoms being persistent headache, reduced and concentrically contracted vision. There are enlarged veins in the head area, contracted arteries, haemorrhagic exudates from the eye which become white and thick. The ordinary

tumour condition is associated with three types of general disease, locomotor ataxia, multiple sclerosis, and general paralysis of the insane. In secondary optic atrophy there is always a pupilitis followed by neuritis, the first reaction on the disc is irregularity followed by enlargement. In dealing with this condition one must treat the original disease and the line of expression of the nervous system along which the effects have travelled from the spine to the brain. To relieve the effects on the eye, treat locally to remove rigidity and congestion, relax suboccipital and cervical contractions and improve spinal drainage by articulating downwards along the neck. Follow by raising and articulating the clavicles and first ribs and thorax generally. Always see that the kidneys and bowels are free in action and treat accordingly.

Pressure symptoms in the eye associated with meningeal abscess, meningitis and encephalitis follow a different line of development. From the meninges inflammation travels to the eye and settles as pupilitis, the stages being swelling and rigidity of the eyelids, conjunctival injection and corneal laziness. The pupils are contracted and there is retinal haemorrhage followed by partial paralysis of the 3rd and 6th cranial nerves and strabismus. The final results are partial or complete paralysis of accommodation and bilateral ptosis of the upper eyelids. Little can be done in the later stages of this condition, but in the earlier stages treat as a typical meningitis.

Ophthalmic migraine is due to a semi-paralysis originating in a basal lesion and conveyed to the eye and accessory fields of the face by the sensory nerves. Primarily there are head pains with photophobia followed by ptosis of the lids, strabismus, loss of accommodation and pupil dilation. Light accommodation and convergence reflexes are absent or disturbed. The disturbance is in the base of the brain and in its relation to the body through the sensory function of the superior cervical ganglion, so that palliative treatment consists of the relaxation of the suboccipital, upper cervical and superior cervical ganglion areas. A similar condition is found in the hydrocephalic child, but there is, in addition, downward rotation of the eye, swollen disc and optic atrophy.

Eye symptoms are important in the diagnosis of multiple sclerosis and locomotor ataxia, nystagmus being typical. This is an ocular ataxia and is absent when the eyes are at rest. Another symptom is a central scotoma associated with a form of colour blindness in reference to the red-green colour. There is irregularity of pupil action, dilation and contraction taking

place as if the marginal border of the pupil was without control. This is due to involvement of the 6th cranial nerve resulting in partial paralysis of some of the eye muscles. Optic atrophy is found in later stages of spinal cord degeneration. It is necessary to differentiate between a scotoma due to nerve exhaustion when the eye will become blinded by prolonged reading but will recover with rest, and a scotoma due to a lesion in the nervous system. Loss of vision often appears worse to the subject than it really is, and as a rule the greater the loss of vision the greater dilatation of the pupil. If in testing the eyes the pupil dilates readily to its maximum, remains so, and does not easily contract, this usually indicates a deep seated nervous disease with a tendency to optic atrophy.

In arteriosclerosis, hypertension and nephritis the arteries of the eye become tortuous, irregular and white; the veins are twisted and show compression where crossed by an artery. White stripes on the vessels indicate sclerotic changes, and haemorrhages are found. Old haemorrhages are indicated by grey or white spots, sometimes the greater part of the eye becomes whitened and atrophy results. Blurring of vision is an early symptom of acute and chronic interstitial nephritis and is caused by oedema and haemorrhage. The points of nerve connections form white spots, ultimately merging into a mass of white, forming a stellate figure on the retina which leads to impairment of vision. The diabetic eye has small white spots and haemorrhages, sometimes an extravasation of blood which covers the whole retinal field. Chorio-retinitis is one of the most common eye diseases associated with syphilis, both hereditary and acquired. Small pin-points of opacity are found in the vitreous and lens, and there are the grey and white spots on the retina indicating degeneration of the nerve endings, which are later outlined in black. The blood vessels become tortuous and sometimes obliterated. In the hereditary form there is a pigmentary retinitis. Acquired syphilis causes a ring to appear in the visual field, more pronounced on dark days and at night, and this produces the effect of looking down a tube as the condition progresses. Pigment leaves the retina and disseminates through the nerve layers, assuming various shapes, while the choroidal vessels are exposed: the vision becoming worse to the point of blindness. The whole field of the toxicology of the body is expressed in the eye-uraemia, septic teeth, tonsils or colon, the effects of drugs or tobacco are all realised either as weakness of the eye or as flashes of light representing some form of squint, divergence, insufficiency of ocular conception, and exhaustion of accommodation, the forms of amblyopia

which represent the beginnings of a loss of vision due to nervousness fatigue, poisoning, or other ocular exhaustion.

The general diseases of the eye that have been indicated are all reactions to, or violations of the principles that govern the function of the eye in its relation to the other parts of the body. By some irritation there is produced a change in the normal structure and function of the eye, therefore these disturbances originate on the sensory side and so involve to some extent the optic nerve, its direct relation to the eye, and the stimuli from other parts of the body that modify optic nerve function. The optic nerve, because of its origin in the base of the brain and its relations with other basal and cerebellar ganglia, functions as a result of the correlation of these ganglia and the correlation of the two halves of the cerebrum, since each optic nerve carries fibres from both cerebral hemispheres.

Both of these factors are determined by the circulation and distribution of blood, lymph and cerebrospinal fluid and this leads to the basal occiput the occipito-atlantal articulation. 1-3C and 2-4T as the controlling vaso-motor field. The sensory side of distribution of impulses coming from different parts of the body is centred in the superior cervical ganglion as the essential part of the sympathetic system in collecting all sensory stimuli from the body for transmission to the brain. Lesion conditions at any level in the spine involve, in particular, the posterior ganglion on the spinal nerve root and its relation to both the sympathetic ganglion and the posterior column of the spinal cord.

IRIDIAGNOSIS

STAFF LECTURE

The eyes are the most highly developed organs in the body. They are sense organs which reflect every part of the body and this is the basis of diagnosis of disease through the eyes. If we consider the eye in relation to the face, the narrower and more covered with hair are the brows, the more brilliant and glistening, is the forehead, with corresponding glistening in the white of the eye. It is often said that some eyes are large and others small, but the truth is that the visible part of the eye is controlled by the opened lids which may vary in height from 9 mm to a maximum of 13 mm. In what appears to be a large eye there is a strip of white above and below the iris, which together with the moistened edges of the iris mark the frame of the eye. If the lashes are long, dense and strongly situated the white of the eye is even more brilliant. Regarding the expression of the eye there is a small lineal furrow on the upper lid formed by a backward folding of the skin, and which almost disappears when the lids are closed. For example, if the bright, moist edges of the upper lid become a little wider than usual, then we have the “languishing eye,” in which the expression appears to be concentrated inwards rather than outwards.

The white of the eyeball is produced through the action of the cornea, being covered by conjunctiva, which is traversed by a network of capillaries. Absence of the normal white indicates that the conjunctiva has become dim in colour because of persistent irritation, and it is through the conjunctival discolouration that the eye becomes yellow. This means that the eye depends on facial expression, facial circulation nutrition; on normal tone and rhythmic activity of the eyelids; on the integrity and functional activity of the conjunctiva; colouration or discolouration of the eye depends on the condition of the cornea. The brilliance of the eye is the reflected light from the conjunctiva and the cornea; the more moist the eye, the wider the opening of the lids and the more pure the white the more perfect is the brilliance upon which is built the diaphragmatic action of the iris.

It is said that the eye is the mirror of the soul, thus disclosing mental conditions. From our point of view, however, the normal eye is an expression of the physical conditions within the body rather than the soul. The normal eye is clear; the glaring eye is nervous, consumptive and degenerative; the expressionless eye is that of the typhoid state; the constricted eye in which the contraction shows in lines is that of insanity.

The eye is similar in delirium except that here the lines are irregular, whereas in the insane eye they are regular. The fragmentary eye which is broken up into segments having no definite relation to one another, indicates death. Enlargement of the pupils indicates worms. Inequality of the pupils is an index to T.B. Decreased mobility in the pupil is always an index of nervous disease. In diabetes and the typical kidney diseases there is variation between enlargement, constriction and unequal mobility. In kidney diseases the eyes seem to vary persistently.

The iris diaphragm is concerned with the admission or exclusion of light to and from the eye and, as such, it is always expressing those conditions within the body, and reacting to changes in the body, as a kind of “body light” which may be observed through the diaphragm. If we can imagine the iris under a high-power microscope it could be divided up into sections which correspond with segments representing some particular part of the body. In this sense the iris is a diaphragm which records any change in the organs and these changes are indexed by variations in colour—that is, by pigmentation. There we can trace day to day changes in the ear, lungs, liver, gallbladder and spleen. Changes round the pupil mark stomach conditions while, at the other extreme diseases of the skin and the lymphatics show changes in the peripheral part of the iris. Minute cloudy white specks are localised accumulations of vapour; marked white lines which are clearly defined express a growth, or accumulation of some foreign material; dark shadings which appear as shadowy black clouds are enclosed by white lines. These lines come first because they represent the primary function of the iris to pick up and reflect the light from without, while the darkness from within shows up as a black cloud indicating pigmentation as found in the liver diseases. Marked black spots appear through the ophthalmoscope like little cinders in the eye suggesting accumulated deposits in some waste area in the body and indicating poor digestion and malnutrition. Similar spots but differing in colour indicate hyperaemia, exudation, congestion, infiltration and diapedesis in different parts of the body; the part of the body involved being indicated by the location of the spot.

If the blood supply is normal in distribution then the spots and lines do not exist, and it is interesting to note that if they do exist and the circulation is normalised in distribution, then the spots and lines will disappear. This means that conditions expressed in the iris depend on circulatory distribution and that the cause from the point of view of the lesion is a vaso-motor condition. This is in contrast to the organic

condition, which is visceromotor, or sympathetic or parasympathetic, whereas the expression of it in the eyes is vasomotor. In its primary form it shows a dilator condition involving the central nervous system, but in some of these expressions, especially in the lines, constriction or contraction may be seen, and this secondary expression is vaso-constrictor. Therefore, the stage of dilation may be related to any of the spinal nerves at any level of the column, while the secondary, or constrictor type is vaso-constrictor.

White spots are always found in the acute diseases, being produced directly in eye disease and indirectly in any disease which reacts on the eye. For example, acute conjunctivitis and acute gastritis both react on the eye and give an identical white spot. During convalescence from acute disease the spots develop into specks which become somewhat coloured in a manner different from the normal colour of the eye. In acute inflammatory conditions white lines are found in the eye with which there is some pain: on the other hand with the spot or speck there is no pain. These lines are very delicate in structure indicating a minute process of contractile change associated with colouration in the area.

In other words the starting point is contractile, but the line develops by colouration, or pigmentation, which means that the quality of the blood comes into play in the final development of the line. During the process of inflammatory resolution the open white lines become closed, which means that structural change occurs in the iris if inflammation persists, and explains the structural changes that occur in cataract and other eye conditions which follow severe inflammatory disease. These white lines appear in pairs, or double pairs; they may disappear or continue for some years in which case there is indicated a chronic condition of the original inflammation. There may result a lessened resistance in the eye and some imbalance in the segments corresponding with the organs previously weakened by disease.

Dark shadows surrounded by white lines as margins of light give an index of chronic inflammation, and mark a tendency towards some degenerative process, the tissues having broken down. If the condition is cleared up the shading will be removed, but if the shading remains permanent after the condition has responded to some extent, it may be regarded as an index of calcification, as found in the iris of the chronic T.B. patient. Here the shading becomes a circle, or semi-circle, and if the T.B. is not cleared from the constitution the shadow remains without the lines and, in time these are replaced by a speck which is usually dark or black, indicating a partial or

entire loss of substance by a degenerative process. For example, when T.B. becomes encysted at some point the dark speck would be its index in the iris.

Following the peripheral margin of the iris there may be found delicate semi-circular dotted lines, and these are typical of all the various types of nervous disease. In the neurotic patient the eye will show this spotted line and in the aggravated case the dotted lines appear in concentric circles all over surface of the iris, beginning at the periphery and gradually developing towards the centre. In attempting to explain the nerve condition we can say the iris is supplied by long and short ciliary fibres which originate from the Gasserian ganglion, the fibres being distributed in connection with the 5th cranial so that there is a close association between the iris and the sympathetics via the 5th cranial. Communication is established within the cerebrum, the fibres being pathways along which reflex influences are carried and are the foundation of localised eye headache.

Communication is also established with the nerve tracts from all the different parts of the body via the cord, and this is the basis for the reflex headache from the different viscera. The pain at the back of the eye corresponds with the segment in the iris which represents the organ involved. Microscopic cross section of the iris shows that the dark and black spots are caused by a degenerative process with origin in the minute anatomy of the iris so that here we have a morbid anatomy of the iris in relation to the nerve fibres.

In associating the different parts of the iris with the different parts of the body we are tracing out nerve connections between the eye and the body. Any impression made on the optic nerve may produce a voluntary or reflex movement of the muscles, not only of the eye but of any part of the body. Impulses to the eye may be carried by the sympathetics, or transferred to nerves supplying the eye from the central nervous system. This is why the iris is of greater value than any other part of the body in the expression of disease because the iris is the only part of the body in which we can see the results and effects of the terminal connections of nerve fibre.

This double function of the eye, internal and external, can be shown by daily examination of the eyes during the process of recuperation from an exhausting disease. The explanation of the pathology of the white lines which indicate a thickening of the nerve fibres, is found in the increased action of these fibres. This is a natural hyperactivity attempting to counteract the pathological changes, and if the increased activity comes

under the control of the C.N.S. the thickening disappears and the nerve fibre returns to normal.

The iris is susceptible to poisons and by watching the changes that occur in the eye we can study the history of toxic accumulation and of the process of elimination.

The prominent signs of the iris may be classified as follows: White spots, which are small white clouds, or misty nebulae. White lines, always well defined. Dark shadings, always misty. These are always enclosed by white lines indicating that external light is trying to penetrate through the internal shadows. Well defined black spots on an internal background, indicate an accumulation of deposits from the structural fields of the body. Coloured spots which vary according to the body conditions. White usually means that the blood flow to the tissues is increased with a local rise of temperature, but as the blood supply becomes normal the white colour disappears. The white spots are seen in the acute diseases, the original colouring slowly reappearing during recovery but with varying intermediate colouration. They also occur in the painful inflammatory diseases, the degree of pain being marked on the iris by the width of the line. If the change is slow then the resisting power of the organism is lowered.

In connection with the dark shadings there are a number of points to be considered: they are an index of chronic inflammation with changes of tissue marked by darkened shading, the degeneration being indicated by the breaking up of the colouration. In many cases this is slow, the lines and shadows clearing up in the centre, leaving small circles, triangles or rectangles on the iris. In the tubercular condition there are dark lines through which no light can be reflected. Thick spokes round the pupil indicate dilation of the stomach. Delicate white semi-circular lines parallel with the periphery of the iris point to nervous disease. The normal colour of the iris is azure blue, which is the general colour of the new-born child, but if the colour changes nutrition will be at fault, the blue returning as the nutrition improves.

Poisons are marked on the iris because they cannot be assimilated becoming deposited and enveloped with mucous in the membranes. Mercury shows in greyish-white rings round the outer edge of the iris, having a metallic lustre, which is always bluish in the brown eye. Quinine, in small quantities appears only in the intestinal ring of the iris, but in large quantities will cover the whole of the iris. The colour is a distinct yellow. There is a long list of colours, lines and clouds resulting from many well-

known poisons. Potassium creates a white crescent in the upper half of the iris. In malignant diseases there is a darkening all over the iris, beginning round the pupils, suggesting that in malignancy the starting point is in the digestion. In the use of glandular extracts, by injection etc., there is a similar darkening, beginning round the pupil. All surgical operations leave black spots which are surrounded by white irregular lines which points to a solution of continuity in a structural part of the body. This is shown according to the part operated on.

The colouring of the eye indicates the condition of body nutrition: the density of the iris always corresponds with the constitutional condition of the body which is fine and delicate in the natural condition, shown by the glistening of the iris and pupil. Coarse density means lack of unity, and failure to co-ordinate organic functioning in the body. Inflammations are marked by white lines, plus clouds, and catarrhal conditions by deep black spots. The white lines are formed by nerve fibre elevation over the surface of the iris, and the dark lines by the darkened background of the iris; the several layers increasing in intensity and forming an internal curtain. Brilliant, glistening red lines indicate rebuilding of tissue, and elimination of accumulations. Shadings, or shadows mark a change occurring in some already existing condition of disease or malnutrition, in the body, and as the shading brightens we have an indication of regeneration.

OCCIPITO-ATLANTAL TECHNIQUE

J. M. LITTLEJOHN

The technique of treatment is to some extent personal to the operator because no two people treat in exactly the same way, but the principles of technique are constant because structure and the relation of structure to structure is an anatomical and physiological fact. Yet we must remember too that, while there is a norm of anatomy and physiology, every individual is to some extent a law unto himself. This is specially to be noticed in diagnosis because anatomical relations are established in each body on the basis of that body's functional capacity for mobility. We must therefore realize that we should not treat the body as a peculiar anatomical mass, but rather as a mass of anatomical units, which units are correlated in a particular way in each particular body. The same idea applies to the functions of the body. They are not correlated in the same way in every person; in fact sometimes anatomy itself chances the course of its blood vessels and nerves and even the postural position of some of its organs in order to accommodate the particular body to its own functional capacity. Hence in our diagnosis and treatment we must take each individual body as the standard.

A carefully educated sense of touch is the key both to osteopathic diagnosis and to operative technique. Looking at the physical body as a mechanism, the disordered condition of which requires readjustment, an educated sense of touch is necessary to carry out this adjustment. First, we must find out the difference between normal and abnormal structural conditions in a particular body in order to detect deviations, which we call lesions. Then we must find out the organic changes which have occurred, not so much from the pathological as from the anatomical point of view. Here the sense of touch comes in, in its higher quality; not the tactile sense of location, but the more subtle sense of touch which evaluates, by means of tissue resistance, the nutritive conditions and tonic state of the tissues and organs of the body. Touch in both of these senses must be used in adjustment. All our adjustment under tactile sense occurs for a specific purpose. It is true that we sometimes give what is called a general treatment, but this is always preparatory to specific treatment and this specificity applies both to the soft and the hard tissues of the body as well as to its organs. There are three distinct ways in which the principles of

adjustment must be applied and which may be named: Soft Tissue Adjustment, Non-specific Articulation and Specific Articulation.

In dealing with a patient it is important to see that the patient is passive. In all movements which are applied to the body of the patient in this passive state the skill of the operator and the weight and energy of his body should be used without depending on the patient in any way. For example, in giving a thrust to re-establish a particular structure in normal correlation with adjacent structures, we should see that the patient is unconscious of the giving of the thrust, because if the resistance of the patient's body meets the thrust it causes it to be practically valueless. The value of thrusts and rotation as forms of treatment rests in the fact that you are seeking by adjustment, and not by force, to compel a particular structure to resume its normal articular relationships. If and when a patient becomes more or less restless under treatment it is sometimes advantageous to change his position from table to stool or vice versa or to change his posture in some way because the body thus changes its attitude to the treatment already given and the muscles tend to relax. Moreover, in treating a particular patient, a mechanical or monotonous routine should be avoided and a somewhat different line of treatment should be followed on each occasion.

There are only three indications for general treatment. First, in so-called constitutional diseases where we are trying to build up the constitution to make it responsive to the mobile condition of the body. Secondly, in certain types of anaemia in which the anaemia is based on some general defect either in circulation of the blood fluids or in the tone of tissues or in both. In such cases a general treatment is invigorating and preparatory to a later attempt to get a specific effect in a particular blood or circulatory field. Thirdly, when the real cause of the disease is obscure, because frequently a general treatment will enable us to specialise or localise the particular condition of the body. In this case it is very important to note how circulation responds to the general treatment: whether the blood localises itself in one particular part of the body, whether nerve irritations are manifested by quiverings, or whether slight pains on pressure or greater pains on rotation and extension are produced.

A general treatment should consist first of a stretching of the spinal column from the atlas downwards, if possible by holding the head firm while an assistant pulls from the legs, secondly of relaxation of all contracted muscles along the sides of the spine beginning in the upper cervical area and pulling the soft tissues out and away from the spinous

processes, and, thirdly, of specialised treatment. This should include extension, rotation and articulation in the cervical region, followed by articulation between the scapulae and in the splanchnic area. Articulation between the scapulae can be effected by placing a pillow under the patient's upper chest or extending the head and neck above the head of the table, articulation of the splanchnic area can be effected with the patient on his face using internal and external rotation of the legs. After this, with the patient first on one side and then on the other, use arm leverage to get free muscle stretching and movement from the upper dorsal to the lower lumbar regions. Finally, with the patient on the side, articulate the lower limbs, flexing and rotating the legs and thighs up against the abdomen while push and pull movement is applied to the spinous processes from L5 upwards.

When undertaking Soft Tissue Adjustment we must remember that these tissues are the anatomical foundation of all mobility in the body. Each muscle should be relaxed in such a way as to make it responsive from the point of view of mobility. There are four different methods of muscle relaxation. (1) Traction, applied either transversely or longitudinally, the object in both cases being to make adjacent and correlative soft tissue respond to the same type of treatment. (2) Deep kneading, in which the hand or fingers are placed solidly over the soft tissues. There must be no moving over the skin surface, the underlying tissues only being subjected to movement. (3) Inhibition. To perform this properly the hand or fingers must be placed over the contracted part and a continuous and steadily increasing pressure exercised until the underlying tissue begins to show signs of resistance. At this moment inhibition should be stopped because when the tissues begin to resist inhibition is being converted into stimulation. Inhibition should begin gently and with a slight pressure which is gradually increased while any movement either of the local field or of the body in general must be avoided. (4) Heat, either in a moist or dry form, may be used as an accessory. Moist heat is appropriate when circulatory conditions are involved in the rigidity, dry heat when the nervous system is involved or if and when the rigidity amounts to a tetanism.

By using the contracted muscles along the spinal column as a guide in locating lesions we are using the lesser areas of contracted fibres in deep muscles rather than rigidity of superficial muscles. These latter are generally contracted either by atmospheric influences, or by cramped postural states of the body or by wrong habits of co-ordination as between different sections of the body musculature. This is to say that the conditions

found in the superficial muscles depend either on the voluntary will of the patient or on some environmental factor. Therefore the superficial muscles are largely taken out of general relaxation measures unless they are being dealt with through the nerves. Hence in modification of muscle tone we deal with the condition of the muscle which is still functioning more or less normally, the contraction of muscle when found being a reaction to nerve impulses either in the muscle itself or in adjacent soft tissues. It should be noted that the purpose of muscle tone is to establish rhythmic movement and to determine the amount and extent of support which a particular muscle gives to the particular part of the body in which it is located. In addition, muscle tone has for a secondary object the assistance of the body in heat production and distribution.

These normal functions may be modified physiologically by voluntary or involuntary movements, and pathologically by such things as exaggerated nerve impulses, toxic conditions distributed through the circulation, mechanical over-stretching which always develops tension, and protoplasmic changes in the muscle tissue itself resulting in hypertrophy or atrophy. It should be noted that hypertrophy or atrophy is the last abnormal change to take place in the soft tissues. The first response to any kind of irritation is contraction, which involves only a slight modification of tone, and is still physiological in character. A contracted muscle, therefore, is one which is increased in tone along normal lines but under what may be called hyper-physiological stimulation. This is sometimes called the acute condition of contraction because, under ordinary conditions, it can last only a short time, because the nerve cell and fibre can only maintain such a condition for a short period. The proper way to deal with this is to deal with the nerve or the part of the nervous system which is involved. When, however, the contracted muscle becomes contractured there is an increase in tone which is not due to the nerve impulse. In most cases it is due to imbalance between one particular muscle or group of muscles supplied from the same nerve origin, and to deal with it we must co-ordinate the nerve impulses distributed in the local field and also co-ordinate the activity of the groups of muscles which usually operate together there.

As the modified tonicity is due to different causes we must deal with them in different ways. (1) Imbalance of nerve impulses in ordinary simple cases of contracture lasts only a short time because the imbalance is functional, but in serious and chronic types of case it may last for the rest of the patient's life because it is due to some degeneration in the bodies of the

cells corresponding with the nerves involved. This gives the foundation of various types of sclerosis, for example disseminated sclerosis, and in such cases the degeneration may be physiological or pathological. If it simply involves a nutritive disturbance it is possible to overcome this from the angle of nutrition and so to correct the nerve cell and compel it to function properly through its fibres. In serious cases the degeneration has gone to the extent of destruction, the structural integrity of the nerve cell has been destroyed and repair is impossible. In both of these types of case the modified muscle tone manifests itself as spasticity, but in the former case the nerve reflexes are still alive while, in the latter, they are dead. (2) Modified tonicity can occur from toxic causes and is to be found in the contracture of the small deep muscles in the acute diseases, the muscles being felt like small lead pencils in the local part or along the whole of the spine. In such cases a true contracture is present, but it is entirely outside the field of the nerve cell and it must therefore be dealt with not from the side of the nerve cells or fibres, but from the side of circulation. We look for and expect to find some vasomotor disturbance and the key to the relief of the contracture lies in the correction of this disturbance rather than in direct manipulation of the muscles involved. For example, in acute meningitis this type of contracture is always found and must be dealt with first from the side of circulation: if and when the circulation is free and the contracture persists the muscles should not be inhibited but should be moved by being drawn in each direction from the spine. (3) Modified tonicity in groups of muscles is also found in acute toxicoses as, for instance, when the liver is in a state of acute intoxication, when the muscles corresponding with the nerve supply to the liver will be in a state of modified tonicity.

In such a case, however, the feel of the muscle is entirely different, being doughy rather than rigid. It is like an oedematous condition but can be differentiated from dropsical conditions by the fact that there is no pitting on pressure. Here the treatment should be to relieve the organs from two points of view. First, deal with the situation from the lymphatic side, considering both the local lymph supply and the general lymph functioning all over the body. Epsom Salt baths may be given or the local part bathed. Secondly, an appeal should be made to the rhythmic conditions in the organ or joint field involved, by such means as stirring up the liver from its spinal centres, D7-9, and giving local rhythmic treatment to the liver itself. The same sort of procedure applies to joints such as the hip, knee and ankle. Rest and absence of movement are contra-indicated, but in treating

the joint begin to establish mobility at a point distant from the part involved. (4) Localised toxic contracture often occurs, the contracted area feeling smooth and appearing shiny. In this case the only method of treatment is to stir up systematic circulation and the systematic nervous system, and thus allow the system to deal with drainage and the establishment of free circulation all over the body and so to relieve the localised condition.

In preparing for the treatment of the cervical, dorsal and lumbar areas of the spine and body we must differentiate between cervico-cranial and sacro-iliac relaxation, the latter being a preparation for the relaxation of the cervical, dorsal and lumbar areas. A lesion of the occiput and atlas is generally the foundation of all the soft tissue disturbances below that level. The articulation of the occiput and atlas is the key to all the sensory disturbances which reach the brain and, through the brain, react on the different sections of the body. It should be noted that in many cases there is a malformation or deformity of the atlas in relation to the occiput. This is a condition which cannot be corrected structurally, but articulation can be established functionally which in the majority of cases leaves little trouble between head and body. A condition which is frequently found here is an enlargement of the transverse process on one or both sides but, even in this case, articulation gets rid of the main disturbance, especially on the sensory side.

The normal movements of this articulation are three in number: (1) a forward and backward rocking movement, sometimes called the “nodding” movement which should normally be simultaneous on the two sides; (2) a slight lateral slipping or gliding movement, one condyle of the occiput slipping into one superior facet of the atlas, while on the other side the occipital condyle rises out of the superior facet of the atlas; (3) a gliding forward and backward of the occiput on the atlas. This last movement is slight but it should always be present. In an attempt to diagnose normal movement, the forward gliding should be tested before the backward, and the forward movement should be made the basis of the backward. If there is difficulty in determining whether cervical movement is normal, first gently glide the head forward while holding the atlas firmly with the tips of thumb and finger, then apply gentle extension before trying to move the head backwards and maintain this extension while the backward movement is being given, and finally apply traction-extension.

Taking account of these normal movements, there are six possible lesions of the occipito-atlantal articulation. These are: (1) a right or left posterior occiput or "rotated atlas"; (2) a bilateral posterior occiput, commonly called an "anterior atlas." In these lesions the atlas slips anteriorly on one or both sides because of the inability of the occiput to maintain normal balance or normal rocking and gliding movements. In dealing with both types of lesion, the most satisfactory treatment is gentle extension, fixing the atlas, and then giving both rocking and gliding movements to the occiput, one after the other as fast as possible. (3) A "rotated occiput" to right or left, also sometimes called a "rotated atlas," but, in this case, the occiput is not posterior, the trouble rather being that one condyle of the occiput has slipped in some way so that the rising and falling of the occiput in relation to the facets of the atlas is abnormal. In treating this condition first determine whether the rotation is to the right or left; if to the right, give extension to the occiput on the right so as to bring about a diagonal position of the occiput in relation to the atlas, then rotate the occiput from left to right while fixing the atlas and maintaining extension. If the condition is left-sided the procedure is reversed accordingly. As soon as freedom has been established, the occiput should be fixed and an attempt made to move the atlas by "push and pull" movements.

(4) Anterior occiput, which is a bilateral anterior lesion, sometimes called a "posterior atlas." Here we are dealing with a type of atlas lesion, the condition apparently arising from the occiput seeking to maintain its anterior rocking and gliding movement against a contrary movement of the atlas and the facets of the atlas slipping so that it becomes posterior. The best treatment is to relax the soft tissues in the occipital region and then rock or glide the occiput posteriorly, following this by extension traction to the occiput. Then fixing the occiput in this position apply a slow rotary movement to the atlas in both directions and forward until it is loosened and moved anteriorly. Then, maintaining the extension if possible, give sudden jerks to the occiput both from posterior to anterior and from anterior to posterior, and finally move the occiput and the atlas on each other. (5) Unilateral anterior occiput, the occiput being forward either on the right or the left. This is generally a secondary lesion to (4) and requires the same line of treatment, but before beginning determine the side on which the occiput is most forward. If it is on the right, fix the atlas, side-bend the occiput to the left and then quickly side-bend to the right: if it is on the left reverse the procedure accordingly. After this follow the treatment laid down for (4). (6) Lateral occiput, in which condition there is

an occipital lesion of a simple side-bending type. If the displacement is lateral give strong extension of the neck by fixing the finger and thumb on the transverse processes of the atlas and giving extension traction to the occiput and atlas. Then, holding the extension at the atlas, relax the occiput and side-bend it slowly to the side opposite the lesion and then quickly side-bend it to the side of the lesion.

The commonest type of lesion is the first, namely the unilateral posterior occiput, and it should be remembered that in these cases the axis of rotation or of motion is a vertical line passing through the articulation which is not in lesion. In most cases the lesion is produced by an unequal traction of muscles and ligaments attached to the occiput following on some primary lesion elsewhere. The commonest type of lesion acting in this way is a dorsal kyphosis. It is therefore useful before attempting to correct an occipito-atlantal lesion to place the patient first sitting and then lying and to test for movement on both sides. Generally the tight side is the one in lesion and, to test this, take into account the sensitiveness and thickening and the degree of prominence of the transverse processes of the atlas with reference to the occiput. The atlas is generally forward on the right, the transverse process being in close proximity anteriorly to the ramus of the jaw on that side, and its posterior border being in front of a vertical line extending from the tip of the mastoid process. This is an indication of a right posterior occiput; the same findings on the other side would indicate a left posterior occiput.

DETAILS OF TECHNIQUE FOR OCCIPITO-ATLANTAL LESIONS

1. *Posterior Occipital Lesions*, which are usually unilateral, are commonly the result either of traumatism in the neck leading to unequal traction of the muscles and ligaments attached to the occiput, or of a lateral rotation in the dorsal area. In the case of a right posterior occiput this rotation will be to the left and vice versa. The preliminary in these cases is to test thoroughly the movements on both sides of the neck, to note the relative prominence of the transverse processes of the atlas in their relation to the occiput and to assess sensitiveness, tenderness and thickening. In a typical case of right posterior occiput the atlas will appear forward on the right with the transverse process close to the ramus of the jaw, while the left side will be practically normal except for sensitiveness when the head is moved on the neck.

To correct, place the patient on his back. First try to get movement in the occipito-atlantal articulation by flexion with general extension added while flexing, and by rotation sidebending both to the right and left with the flexion-extension maintained. If this is not successful try to get deep relaxation of muscles and ligaments by deep inhibition followed by actual movement of the articulation. After this pull the patient upward so that his head extends beyond the head of the table, place your abdomen firmly against the top of his head, your left hand under his chin, fingers of the right hand under the occiput, thumb of the right hand on the right transverse process of the atlas, then move the joint as indicated. Be careful not to make too much pressure on the T.P. because this is the sensitive and tender point, and to aggravate pain destroys relaxation and prevents movement and adjustment. If the original movement is not successful the following procedure can be followed. Carry the chin of the patient towards the right, keeping the face upwards without rotation. This produces a left lateral flexion of the occipito-atlantal articulation and tends to lift the condyle of the occiput on the right upwards and outwards on the articular facet of the atlas. While maintaining this position lift strongly on the chin and lower the top of the head by pressure with the abdomen. This will produce extension of the articulation. As soon as complete extension of the occipito-atlantal articulation is produced, the head should be placed in left lateral flexion, steady pressure being kept up with the thumb. If this steady pressure does not move the atlas towards its normal position then give traction-extension with one hand under the chin and the other on the posterior occiput.

A second method which is specially suitable if the patient is very rigid in the lumbo-dorsal area is performed as follows. With the patient seated on a stool relax the spine from below upwards by general shoulder grip movements with counter pressure on the spinous processes on the opposite side. Then with the patient on his back use movements as indicated to produce flexion, extension and rotation. Then, with the patient again sitting, pull up strongly on the occiput, one hand being under the occiput with the thumb over the displaced T.P., and the other hand under the chin, and continue the pull until the head is lifted off the atlas. Note the range of movement in the neck and head by twisting the head slowly to the right and left as far as is possible without pain. Extension of the spine is to be avoided in this case which is why the technique is performed with the patient sitting. Then stand on the right of the patient, place the right hand under or on the chin and have the back of the head resting in the crook of

the elbow. The patient must relax thoroughly so that the head rests easily. Make a fixed point with the left hand below the atlas, because it is difficult, if not impossible, to make a fulcrum on the atlas. Then when the patient is completely relaxed, swing the head slowly well upwards and towards the left. If this is unsuccessful, apply fixation with the finger and thumb at a fixed point below the atlas, and swing the head first upwards and towards the right and then upwards to the left. Then from this left position drop the head slowly forwards as far as it will flex anteriorly, then quickly flex the head posteriorly and give a few swinging movements from right to left and left to right.

A third method is performed as follows. The patient is seated on a stool and the operator stands in front with palms against the neck of patient and index fingers resting against the T.P.'s., and tips of the fingers in contact with the mastoid processes. Then the patient should relax thoroughly from below upwards, and the head should be dropped on the right hand of the operator causing a left lateral flexion and rotation-sidebending of the occiput on the atlas. At the same time the head should be extended as far back as possible by rotation, this rotation being continued either until there is a "pop" or until there is complete freedom of the occiput on the atlas. This treatment can also be given with the operator standing behind the patient using the hands and middle finger as before to determine the range of movement in the articulation. Then with left lateral flexion and extension the same movement for correction by rotation can be carried out. These techniques can be applied in reverse for a left posterior occiput.

2. *Bilateral Posterior Occiput (Anterior Atlas).* In this case the primary disturbance is occipital and the so-called atlas lesion is a secondary effect. Always test for movement and try to determine how much movement there is anteriorly and posteriorly before giving any corrective treatment. Remember also that it is always possible that the T.P. of the atlas is abnormal, too large or too small. To test for this lesion: drop a line from the mastoid process which will pass just behind the posterior aspect of the T.P. of the atlas, and it will also be found that the anterior margins of the T.P.'s of the atlas approximate closely to the rami of the jaws on both sides. Also the cervical curve is accentuated (i.e. C2 to 5 are anterior), there is restricted movement shown especially in dragging at the angle of the jaw when the head is moved, and there is always pain and tenderness of the middle of the neck posteriorly when the head is flexed forward.

Treatment. With the patient on his back, relax by inhibition, traction, and head and neck rotation under traction. Then flex, extend and side-bend the head and neck. Repeat this until the neck is relaxed. Then (1) Pull the head over the end of the table about six inches; (2) Place the head against the abdomen while the balls of the thumbs are placed against the T.P.s. of the atlas with fingers clasping the back of the head; (3) Press down firmly on the head to get extension of the joint by throwing the lesion condition more anterior; (4) Then raise the chin and depress the head while keeping the top of the head in the median line; then lift the chin to the right and left while keeping the head extended; (5) At this stage lower the head as a whole and continue the lowering movement until the neck is quite free. It should be noted that normally the anterior part of the condyles of the occiput rest on the posterior surface of the superior facets of the atlas. In anterior atlas conditions, however, the posterior ends of the condyles are resting on the anterior ends of the superior facets of the atlas. Hence all that is necessary, when enough relaxation has been secured, is to keep up extension while tending to throw the occiput forwards, but this forward movement must be given in extension.

Another method is as follows. With the patient on his back the right hand is placed on the back of the patients neck and the left under his chin, and movements are carried out as indicated. There is a danger that movements which occur while replacing an anterior atlas lesion may lead to a greater anterior lesion in the mid-cervical region. The principles involved in this treatment are flexion-extension and rotation-sidebending conjoined, but always under extension. After correction, neck exercises should be prescribed to strengthen the neck muscles and establish the occiput in its proper relation to the atlas.

3. *Anterior Occipital Lesions.* This is an extension lesion of the occipito-atlantal articulation, i.e. a posterior atlas. In this lesion the articulation is in a position of flexion, the posterior extremities of the occipital condyles being thrown forward on the anterior extremities or superior articular facets of the atlas. It should be noted that in all primary lesions of this articulation the normal movement of the occipito-atlantal joint is limited, and, if it becomes secondary, the articulation becomes immobile, i.e. the normal anterior curve is diminished, the lesion being bilateral.

The S.P.s. of cervical vertebrae in a state of lesion are always prominent, but the prominence is a compensation for the lesion because the head always has a tendency to tilt upwards if left to its automatic activity; the

attempt to straighten the head (i.e. to flex it forward) is due to the desire to keep the spine in the normal erect posture. This is why we place second in the way of relaxation treatment, relaxation of the sacro-iliac field, because sacro-iliac rigidity, including L5, tends to drag the head backwards in an attempt to maintain erect posture. Tilting the head forward under these conditions is a common cause of pain in the lower part of the back. If and when this pain exists from this cause always advise the patient when lying down to rest, to lie face downwards, because in this way the sacral tension is relieved by the relaxation of the neck, the cervical curve tending to pass from the abnormal extension condition to the normal flexion condition of this anterior curve. As in all typical lesions, when there is pain and tenderness, there is a contracture of muscles and ligaments. The chief muscles involved in this case are: (1) the Rectus capitis posterior major and minor and the Obliquus capitis superior (on both sides), (2) Flexors, the Rectus capitis anterior and the Longus capitis (on both sides). The two sets of recti muscles are antagonised by the Oblique muscles and the object of treatment and exercises is to restore balance between them.

Treatment. With the patient on his face, grip the head without fixation of the atlas and apply traction to the head and neck with the weight of the body providing resistance. Follow this by sidebending the head to right and left, placing one hand over the T.P.s of the atlas to keep the neck in fixation; follow this by anterior and posterior flexion of the head and neck (the fingers being moved away from the T.P.s of the atlas). This procedure is the best palliative treatment for the relief of contracture in this anterior occipital lesion. Follow by giving exercises to the patient to develop weakened muscles and to establish balance as between the muscles. The main point is to try to restore the normal range of movement in the joint.

Any kind of manipulation which produces flexion of the joint will tend to correct the lesion. For example: With the patient lying on his back and his head beyond the end of the table, the operator places the head against his abdomen and rises on the toes until bending over the patient, while doing this depressing the chin and raising up the occiput. This position should be maintained throughout the treatment. Then place the heel of both hands over the zygomatic bones with the fingers grasping the posterior borders of the T.P.s of the atlas. Carry the patient's chin to the right as far as possible so as to produce a lateral flexion of the articulation and at the same time bear down with the abdomen against the head of the patient while using the arms to maintain lateral flexion. The top of the patient's head should be held solidly in the median line, that is to say do not rotate

or turn the head in taking the chin to the right but maintain flexion while carrying the chin to right and left, repeating the treatment five or six times. Then starting from the median line again reverse the movement by carrying the chin to the left, always increasing the flexing force by pressure with the hands and maintaining it when the chin is carried back towards the right. Do not use pressure on the T.P.s but simply use them as guides in rotatory and flexing movements. Finish by traction-extension applied to the head only (with the patient still on his back).

4. *Twisted Atlas and Twisted Occiput.* A rotated occiput is a cranio-atlantal lesion in which the posterior extremity of one occipital condyle is found to rest on the anterior extremity of the corresponding superior articular facet of the atlas, and the anterior extremity of the other condyle rests on the posterior extremity of the corresponding facet. We thus find either, (A) the occiput rotated forward on the right and backward on the left, or (B) vice versa. These two types of lesion are quite distinct, but the one is always the counterpart of the other. That is to say, A is the typical lesion and B, if it exists, is often a secondary condition which develops from A. When the right condyle moves forward the left moves backward and this is known as an occipital rotation to the left. The foundation of this lesion may be traced to the normal movements of occipito-atlantal articulation because this rotated position (one condyle forward and the other back) is the easy and natural position which the head assumes when the cervical region is in slight lateral flexion: the lesion resulting from an exaggerated movement to put the neck in a restful position.

A person whose bones are in normal position and properly mobile has a normal range of movement in the occipito-atlantal articulation and this normality is maintained, (a) by turning the face strongly towards the left, (b) by moving the right condyle forward and the left backward, and (c) by a proper state of the soft tissues. The occiput can in such conditions move as far as the soft tissues will allow it and it is not abnormal for the occiput to move on the atlas forward on one side and back on the other. What is abnormal is for it to be moved and be retained in fixation by muscular contracture and ligamentous thickening. Thus the primary cause of the lesion is asymmetry of the muscles and ligaments on the two sides of the neck. This asymmetry develops because circulation of blood and lymph and distribution of nerve energy becomes unbalanced and the nutrition on the two sides of the neck becomes unequal. This is the one part of the spine which suffers very materially from this condition, a thing which can be traced to (a) the imbalance of organs in the body trunk, especially the

liver on the right and heart, stomach and intestines on the left, and (b) the tendency of the 10th cranial nerve, if interfered with, to unbalance the field of the internal organs, because the left 10th cranial controls the heart while the right controls the liver, stomach and intestines (as far as the sigmoid flexure). In exaggerated right cranial conditions there is always a superficial reaction of the left side of the trunk so that the cardio-vascular apparatus is pitted against the hepatic and alimentary apparati, with a superficial reaction in the nerves and blood vessels on the left side. This is why an occipito-atlantal lesion so often causes disturbance of nutrition and of visceromotor functioning in the abdominal cavity.

This type of lesion is often produced either by local injury or by an inflammation in the joint itself. The cause of trauma is usually forcible rotation; some cases are due to muscular over-activity, but in this case the occiput is usually lateral towards the side on which it has moved forward. The principal muscles involved in such a case are those which cause lateral rotation, such as the sterno-mastoid, semispinalis capitis and obliquus capitis superior on the right, and the longissimus capitis, splenius capitis and rectus capitis posterior on the left. A primary lesion is associated with a lateral curvature to the left in the upper cervicals, the convexity towards the left being a compensation.

It should be noted that an individual cervical lesion forward on the left is always compensated for by a forward rotation of the occiput on the right, that is to say left and right balance each other by rotation in one direction and lateral movement in the other direction. In general the compensation is established between the atlas and the axis, that is to say individual occipito-atlantal lesions have as their compensation a rotation of the axis on the atlas, the rotated occiput being found as a secondary lesion due to a lateral cervical curvature which occurs in the attempt to establish a normal relation of C1 and 2 to other cervical vertebrae, that is to say the secondary occipito-atlantal lesion is postural and represents the attempt of the neck to establish normal balance on the spinal column as a whole. The occiput moves laterally to the side on which it moves forward.

Diagnosis. Palpate the interspace between the anterior border of the T.P. of the atlas and the posterior border of the ramus of the mandible. Palpation will indicate widening of the space on the right and narrowing on the left, the posterior border of the right T.P. being considerably behind a vertical line drawn from the apex of the mastoid process and the left being entirely in front of such a line. Both borders should be palpated to assess

the variation. It should be noted that the normal rotary movement of the articulation is entirely lost and other movements of it lessened or limited. When compensation is established there is a rotation of the atlas on the axis, forward on the left and backward on the right. Therefore, before correcting the lesion examine the whole spine from below upwards. Following this give a general treatment and then local treatment with the object of removing adhesions and contractures so as to lay the foundation for the correction of the lesion. Make a careful note of the condition of the joint: the occiput is rotated on its central axis with the right condyle forward and the left condyle back: in inflammatory cases the capsular ligament is thickened, posteriorly on the right and anteriorly on the left; in some cases adhesion and contracture is greater on one side than the other.

The first local treatment, therefore, should be deep relaxation with inhibition, traction-extension and twisting of soft tissues by general rotation of the neck. Following this any manipulation to rotate the occiput on the atlas, backwards on the right and forwards on the left, will correct the lesion. For example, extend the occipito-atlantal articulation by traction so as to move the condyles to their maximum anterior position on the atlas: the result being to release the forward movement of the left condyle and so break up adhesions on the left. Follow this by flexing the occiput completely by giving a movement to correct a bilateral anterior occiput, or any other movement which will move the anterior extremities of the occipital condyles towards the posterior extremities of the posterior facets of the atlas: the result being that the condyle moves back on the right and any existing adhesions on the right are removed. By these two procedures the adhesions on both sides should be broken down.

Then, with the patient on his back and his head extended over the end of the table, the operator should place his abdomen against the head and press down firmly to hold the head securely. He should then place the heel of his right hand on the right zygomatic bone, directing the fingers down and back so as to grasp the posterior border of the T.P. of the atlas with the middle finger. Then he should place the thumb of his left hand on the anterior border of the T.P. of the atlas and pass his fingers under the occiput. If the neck is not straight traction should be applied, keeping the top of the head in the median line. Now the operator should make downward pressure on the top of the head with his abdomen, using enough force to raise the chin and depress the occiput, and then carry the chin to the left by pressing towards the left with the right hand and pulling with the left, but not rotating the face or moving the top of the head from the

median line. This movement should occur in the occipito-atlantal articulation only and the direction of movement is a lateral flexion.

As soon as the limit of lateral flexion is reached the head and neck should be held in fixation and lifted so as to produce a complete flexion of the occipito-atlantal articulation. This is done by lifting the chin and depressing the occiput, while the top of the head remains in the original position. The result is that the left condyle moves forward which causes the head and neck to be in extension so that the chin moves towards the right until the neck is straight. At this juncture the operator should stand on tip-toe and lean over the patient, and in doing so should carry the top of the patient's head upwards until the occiput is lifted higher than the chin. This changes the extension of the occipito-atlantal joint into flexion, but note that this is done by lifting the occiput and not by depressing the chin which remains free. Therefore this should be followed by carrying the chin to the right of lateral flexion up to the maximum but without turning the face to the right or moving the top of the head. Then the lateral flexion should be maintained and the chin depressed by pressure over the zygomatic bone. This final movement completely flexes the occiput on the atlas and results in moving the right condyle posteriorly. After this the operator should continue to hold this flexion and carry the chin back to the left till the neck is straightened, and then depress the occiput and raise the chin while continuing to move it to the left until the maximum of left lateral movement is reached.

This last movement if repeated from time to time will remove any contraction of soft tissues and permit the natural correction of the lesion. After the lesion is corrected the occipito-atlantal articulation should be put through its entire range of normal movement: flexion, extension, lateral flexion, and rotation of the head on the atlas receiving attention as well as the movements of the head and atlas on the rest of the neck with fixation applied at C3. Exercises should be prescribed for the muscles which produce rotation of the head. The best method is for the patient to contract the muscles on the left of the neck while the neck is laterally rotated towards the right, and vice versa. Lesions of the upper cervicals can be corrected in this way.

OSTEOPATHIC NECK TECHNIQUE

JOHN WERNHAM

In considering problems of osteopathic technique, it is helpful to begin with a restatement of the physiological movements of the spine, for, without a clear mental picture of the way in which the spine behaves under weight-bearing, it is difficult to follow the principles involved. In the space available, we can only make brief reference to some of the points in connection with our present subject. We bear in mind that the vertebral bodies tend to behave like a pile of blocks while the facets govern rotation so that we have the combined movements of flexion-sidebending-rotation, and extension-rotation-sidebending. As this behaviour differs from one region of the spine to another, there are physical characteristics in the cervical spine which are not common to the lumbar and thoracic regions.

In the cervical region, the bodies rotate into the concavity in both flexion and extension. According to Fryette this is due to the peculiar shape and angle of the articulations. He also says that the commonest lesion in the spine is that of the axis on the third and that a rotation lesion is the dominant condition, as one might expect. He goes on to say that the degree of rotation in the atlas-axis articulation is amazing. According to Halladay, the possible range of movement is 90 degrees, which is a lot, but, if we look at the articulating facets, it is evident that provision has been made for a wide latitude of rotary movement. Fryette goes on to talk about the occiput-atlas, atlas-axis and axis third combination and suggests that the key to this upper cervical group lesion is sometimes found to be the axis on the third and I am going to demonstrate this technique later on.

ARTICULAR INTEGRITY

It is distressing to observe that so much clinical work of a physical nature is performed in the name of osteopathy which makes no attempt, so far as can be judged, to establish what may be termed articular integrity in the spine and pelvis. It should be remembered that this is the object of osteopathy. The secret, if there is a secret, is the production of balance, a principle which does not seem to be wholly understood. It seems that the treatment of the pelvis, for example, is practically non-existent while the neck undergoes a good deal of popping and cracking which is of doubtful

value and it may be suggested that this kind of outlook is not conducive to the establishment of a state of physiological harmony.

SOFT TISSUE TECHNIQUES

It is necessary at this point to say something about soft tissue technique. It seems that fashions wax and wane in osteopathy as they do in other fields of activity, and it now appears, according to some, that we can afford to ignore the hard tissues of the body and confine our manipulative attentions to the soft tissues, in the belief that the skeleton will straighten up in response to this kind of approach. This is not true all of the time. The writer has seen patients reduced to a chronic low level of muscular irritation, and has also seen patients in a state of nervous exhaustion as the result of manipulative procedures in which skeletal articulation and/or correction have not been employed. It may be suspected that these relatively simple manoeuvres have become popular for obvious reasons but we have to remember that the skeleton is an articulated structure, and we know that if it fails to articulate properly, then the body is heading for trouble. The “total lesion” leaves nothing out and it is no use pretending that certain aspects of the case are unimportant if and when we find them difficult to diagnose or correct. If we take this attitude, we shall not be in the position to help some of our patients as we ought to be.

One would have thought that the failure of physiotherapy provides sufficient warning on this point. It is always one of the curiosities of medicine that the physiotherapists appear to cover all the essentials of physical treatment. They manipulate and massage, they employ traction and other suitable treatments and yet the thing does not “gel.” Why? Because they refuse to recognise the principle of articulation in treatment and the correct application of body mechanics in their physical medicine.

In a word, “you cannot get away with it.” Either the principles of osteopathy are applied or they are not.

In the cervical region extension is the normal condition and flexion is a modification of extension. In lateral flexion plus rotation, there is a side-bending movement which first abolishes the extension and then converts it by sidebending into rotation. Under normal conditions cervical flexion is unevenly distributed. If this is not the case, the neck is found to be straight instead of curved anteriorly and, in this type of neck, the initial trouble is to be traced to individual vertebral lesions and not to the arch as a curve, or to the balance between flexion and extension. The first cause of disturbance is

found in the disc between 2C and 3C, which is much thinner than the other cervical discs. Now, pressure in the disc is determined by the degree of fluidity inside the disc, and the degree of rigidity around the disc. The margin of the disc is the area of ligamentous insertion, so that the lesion condition is not bone, or muscle, but ligamentous and fluid.

A SIGNIFICANT POINT

Another significant point is that the anterior border of the lower margin of the body of the axis projects forwards and downwards, forming a bony obstacle to forward flexion, so that when flexion is lost, an axis lesion is present, the body of the vertebra being posterior. There are certain points to be observed when attempting correction. Firstly, in the flexion lesion the neck should be in extension before correction is made. Secondly, in sidebending-rotation, where possible, the contrary rotation should be made from the vertical position. Where the disc is involved, we should deal with the ligaments by articular rotation, and with the fluids by traction-extension. Littlejohn has suggested that to correct the axis, the operator should apply fixation to 3C and flex the head backward, then rotate laterally, first right then left into forward flexion, hold, while relaxing 3C, and follow by extension of head and neck on 2C and 3C. This will correct the axis and establish normal flexion on the basis of extension.

EXTENSION IN THE NECK

We must note that in the neck, extension is a free movement limited only by the approximation of the spinous processes. The supra- and infra-spinous ligaments, the ligamenta flava, the articular capsules and the posterior common ligament are all relaxed, but the movement affects the anterior common ligament to the greater extent as it approximates the spinous processes to each other. This means that extension is the ideal form of treatment in all ligamentous conditions in the neck. Under extension the inferior facets move downward and backward on the superior articular facets of the vertebra below. This causes compression of the posterior part of the disc and extension of the anterior part of the disc, and, according to J. M. Littlejohn, this position of extension correlates vertebra to vertebra through the discs in the entire cervical region.

In flexion the ligaments are extended, the spinous processes are separated and the anterior and posterior sections of the disc are

unbalanced. If we are dealing with a type of lesion involving the spinous process, we should treat in flexion and this applies, also, in the disc lesion, but in this case, it is a modification of extension, so that we extend first and then flex.

In lateral flexion neither extension nor flexion are normal, the starting point of the imbalance being rotation. If the lateral flexion is to the right, the body of the vertebra rotates to the right, the anterior common ligament is directed down from right to left, the disc is thinned postero-lateral on the right and the inferior facets move downwards, backwards and inwards. In the chronic state the supra-spinous ligament is directed down obliquely from left to right, the left ligamentum flavum is extended and the inferior facet on the left moves upwards, forwards and outwards. Side-flexion is always associated with some degree of rotation in the cervical area. This implies strain on the ligaments and cartilages and these structures must be relaxed by gentle rotation without regard to the muscles and bones before making a specific correction.

DIAGNOSIS

Diagnosis in the cervical area is not difficult when the essentials are understood. Other than this it can be difficult and can degenerate into a series of cracks which have no meaning. Consequently, there are a number of points which should be carefully noted. The transverse processes are very irregular, thus affecting their value in diagnosis. The spinous processes separate in flexion and approximate in extension and if they do not move the vertebra is rotated and sidebent. Very marked anterior or posterior lesioning is impossible and the principal lesions are modifications of flexion and extension. Lateral flexion lesions are diagnosed from the prominences of the articular processes. These are approximated on the side to which the face is turned and separated on the opposite side, the upper process being the most prominent. The range of movement is limited by the ligaments and in gross lesions, the ligaments are on tension. If the limitation is unilateral, we have lateral flexion plus rotation, if it is bilateral the type of lesion is extension.

The neck has a wide range of movements and contracture is found in the following muscles, under the given conditions:

Trapezius. In rotation and flexion to the same side with the face turned to the opposite side.

Levator Anguli Scapulae. In rotation and side flexion to the same side.

Splenius Capitis. In rotation and side flexion with face turned to the same side, following in the wake of trapezius.

Ilio Costalis Cervicis. Secondary to splenius, but only with rotation and side flexion involving the lower cervical.

Longus Capitis. Following in the wake of splenius but only when there is an extension complication.

Anterior, Posterior and Medial Scaleni are involved in lateral flexion to the same side but only when the lateral flexion is complicated by a rotation to the opposite side. This is the typical form of muscular rigidity occurring in those cases in which there is flexion in one vertebra and rotation in the adjacent vertebra.

Longus Colli. In the flexion conditions with only slight rotation.

Rectus Capitus Anterior Major and Minor follow the longus colli and if the condition of flexion with slight rotation persists these muscles play in harmony to the point of rigidity when the muscular resistance is handed over to the *Sterno-Cleido-Mastoid*. Each side acting alone rotates face to the opposite shoulder and sidebends neck to the same side. In these muscles is found the terminal contracture preceded by the longus colli and the rectus which goes back to the flexion condition of the scaleni.

THE VERTEBRAL CIRCULATION

We must remember that the vertebral arteries always follow the vertebral movements and if we are modifying the vertebral circulation the vertebrae must be put through the normal range of movement, and the soft tissues round the processes must be relaxed and softened. The sensory nerves are commonly involved and the chief lesions are extension or side-bending rotation, the effects of which are felt in the concavity, that is on the other side of the lesion condition. The foramina are enlarged in the flexion lesion and conversely diminished in the extension lesion. so that the latter is the more serious type.

Research experiments have shown that the osteopathic lesion does not involve the closure of the spinal foramina except where the conditions of secondary inflammation exist, with the subsequent enlargement of the soft tissue structures. The lesion is not necessarily a misplacement or a

dislocation, but is the movement of a part of an articulation to the point of fixation within the normal range of movement.

THE LESIONS

The chief lesions are four in number:

(1) A degree of tension, more or less greater than normal of the encased fibrous tissue which anchors the structures as they pass through the spinal foramina. This is the typical occlusion lesion and does not show in the X-ray.

(2) Unbalanced muscular lesion leading to congestion and inflammation. Here the tension in soft tissues is the lesion and not the alteration in the position of the bone.

(3) Vertebral rigidity produced by muscular contracture; here the cycle of the muscles is changed so that the lesion is not a tension but an arrhythmia of the muscle.

(4) The marked vertebral lesion produced by the over-strained tissue in which the condition passes from the muscle to the ligament, especially the capsular ligaments, the cartilages being only slightly involved until impaction takes place. This is the historical development of the lesion as found in the dorsal and lumbar. The condition is postural and involves the basic foundation of the spinal column in the sacro-iliac articulation. The technique of treatment, therefore, is not the correction of the individual lesions but the correction of the postural conditions in the spine, and in the body as a whole.

In the cervical area, however, the development of the lesion condition is entirely different from that in the lumbar and dorsal areas. In the neck we find larger and stronger muscle attachments and the lesion is caused by uneven, unequal or unbalanced traction of the muscles. Here the contracture is the result of disturbed "single cycle" contractions, so that the cervical lesion is produced by a change in the tension of the units of the cervical region and not of the group of vertebrae. These lesions, furthermore, are associated with congestive and haemorrhagic conditions which, post mortem, are shown to occur round the anterior and posterior nerve roots and inside the membrane of the cord between the pia mater and the arachnoid. That is to say, we have internal cord conditions in the cervical area and purely external muscular conditions in the dorso-lumbar areas. It is said that the reason for this is that the intense contracture

causes pressure, not in the foramina, but in the cord, giving rise to the internal haemorrhage, and because the lesion changes involve either the individual nerve fibres singly, or the entire nerve trunk. In other words, the cervical lesion is a nerve lesion while the dorsal and lumbar lesions are articular lesions which are associated with the surrounding soft tissues. This means that the technique of treatment in the neck should consist of relaxation of the contracted tissues followed by direct correction of the individual vertebral lesion.

SENSORY CONDITIONS

The majority of nerve impulses from the articular surfaces of the ligaments, tendons and muscles pass through the spinal ganglia to the posterior column of the cord, this being the means whereby Nature picks up abnormal sensations and transfers them elsewhere. Consequently, a secondary organ disturbance must always be traced through the spinal ganglia along the posterior column and the posterior nerve roots to the cord itself, the circulation being more protected in the posterior column. This means that the pathological conditions are all of a sensory nature, so that the cervical lesion is a sensory condition, and this explains why cervical lesions are so sensitive. This is why the articular surfaces, muscular and ligamentous, should always be relaxed before correcting the lesion, and also for the reason that the lesion is maintained through the ligamentous contracture. Thus, in the cervical area the articular lesion must be corrected first, while in the dorsal and lumbar areas the tension lesion is corrected first.

ROTATION TECHNIQUE IN THE NECK

It has been said that more patients have been lost to osteopathy through mishandling of the neck, than for any other reason. I think this is true. The treatment I have sometimes received on my own neck has been painful and indeterminate, and I have been spending a little time trying to discover why this should be. It seems that in his anxiety to grapple with the neck problem the young operator tends to give the soft tissues a pretty thorough preliminary treatment, apparently to get the patient into a suitably receptive condition for correction. This, on occasions, I have found to be a distressing process, which leads me to my first point. The neck should only be handled by the fingertips so far as is possible, and only a delicate pressure should be exerted. For the purposes of diagnosis light rolling of

the head against the pressure of a fingertip placed lightly behind the transverse process is sufficient to test for lesioning. Relaxation of the soft tissues may be carried out by a similar movement, lifting up the posterior tissues with the tips of the fingers. I prefer to do this on one side at a time, not forgetting that the anterior tissues must also receive attention.

APPREHENSIVE

In coming to the correction proper, it is my experience that the operator is apprehensive, and that the patient can be aware of this. I think the difficulty here is that we are so busy flexing, extending, sidebending and rotating, busy applying lever and fulcrum, and persuading the patient to relax, that we tend to forget the advice of a well known osteopathic pioneer, namely, that we should “think” our correction. In other words, we should have a miniature picture in our minds of what is happening in the patient. In demonstrating this technique I am not concerned with the fundamentals of procedure only, but also with my own clinical findings and how I treat the neck. If we refer to the mechanics of the spine we can see that if the pelvic base is tilted the 4th dorsal moves to the same side and the atlas is tilted down to the opposite side. This is the basis of the compensatory curves in the spine which are very commonly to the right in the dorsal area, and to the left in the cervical area. The great majority of lesioned necks are found to behave in this way, and the great variety of lesions found at the occipito-atlantal articulation (Downing lists eleven of these) are desperate attempts to accommodate the balance of the head upon the distorted mechanics below.

It is not without interest to note that this curving line is carried on to include the cranium, so that one sees the typical kidney-shaped head with the flattened and bulging temporal lines and all the other diagnostic signs described by the exponents of cranial technique. Such considerations do indicate, of course, how careful we must be not to regionalise the body too much.

In practice much of the work of correction is confined to the left side of the neck and it would seem from the results gained, that this kind of approach is justified. The title of this section is rotation technique but I am reliably informed that it is a composite technique and employs something of all the techniques. This may be so but the essential thing is that the correction is painless in operation and there is rarely a painful reaction

following the treatment. In the following paragraphs we shall confine our attention to the manipulation of the upper half of the cervical region.

Demonstrating and describing osteopathic technique intelligently is extremely difficult and it may assist to number each step in the procedure.

(1) With the patient on the back and without a pillow, pass the left hand under the base of the occiput, place the thumb on the bony structures below the occiput and use the fingers to rock the head against this resistance. The operator's arm should be resting on the table and not flexed at the wrist.

(2) Having located the lesion, the operator "closes up" to the patient and cradles the chin and lateral aspect of the head with his right-hand forearm, taking care to avoid pressure on the ear.

(3) The patient's head is now supported and controlled and may be flexed, extended, rotated and sidebent, but it must be remembered that these are the four parts of a "unit movement," and they are not to be consciously separated. None of the movements should carry the head away from the midline of the body, and the "unit movement" should never be lost at any time during correction.

(4) In my view, there is too much chin wrenching by some operators. This gives rise to loss of tension at the critical moment and too strong a pressure on the neck tissues. The correction is made by means of a thrust with the thumb, rotation with the hand under the chin and sidebending with the forearm. It seems that the sidebending is the most neglected of the three aspects of the technique.

(5) Sometimes the correction is more effective if the hands are reversed. In this case the fingers of the right hand are applied to the bony structures on the left side, and the thumb is braced over (not under) the angle of the mandible. The left hand and forearm is employed exactly as under (2) above. Here there is no thrust but rather a pulling action on the lesion area.

(6) The last element in the application of the technique is that of traction. This is almost completely neglected which explains some of the failure and the pain in trying to reduce cervical lesions.

Finally, it should be remembered that in osteopathy it is not merely what you do but the way that you do it and the objective that you have in mind that matter.

LITTLEJOHN TECHNIQUE (SACRO-ILIAC)

JOHN WERNHAM

In the sacro-iliac articulation we probably find more maladjustments than in any other part of the body. In the case of subluxation there is always a slight change in the articulating elements. In strain there is always either injury, or an inflammatory condition of the structures adjacent to the joint resulting from a sudden mechanical irritation which most frequently begins in a fibrositis. The exciting cause may be ligamentous thickening followed by adhesion, but all these changes most commonly affect the interosseous, and the long and short posterior sacro-iliac ligaments. If fibrositis develops from the psoas muscle and settles in the sacro-iliac area it tends to pass to the fibres of the gluteus medius muscle where it can be easily palpated and forms the basis of the diagnosis of an immobile sacro-iliac joint.

Applied Anatomy. The stabilising effect of the glutei (medius and minimus) on the pelvis, when the foot of the opposite side is raised from the ground, is dependant on three conditions, viz.: (1) the two muscles must be functioning normally; (2) the components of the hip-joint, which forms the fulcrum, must have their normal relationship; and (3) the neck of the femur must be intact and must exhibit its normal angulation to the shaft of the bone. When any one of these three conditions is not fulfilled (e.g. (1) paralysis of the glutei, medius and minimus; (2) congenital dislocation of the hip-joint; (3) un-united fracture of the neck of the femur or coxa vara.) the stabilising mechanism is upset and the pelvis sinks on the unsupported side when the patient stands on the affected limb. This is known clinically as the 'Trendelenburg sign'.

"Paralysis of the glutei medius et minimus is the most serious muscular disability in the region of the hip, and patients suffering from this condition have a characteristically lurching gait. On the other hand, when these two muscles remain intact, even though many of the other muscles which act on the hip-joint are paralysed, the patient is able to walk, or even run, with remarkable little disability." (Gray's Anatomy).

The maladjustment of the joint follows the adhesion condition but sometimes it is in a state of hyper-relaxation, in which case the inflammatory process, or the irritating mechanical condition, passes into the muscles of the lumbar region or into the upper part of the leg. The

chief function of the sacro-iliac joint is that of movement which is either one of balance in relation to the equilibrium of the pelvis as a whole, or, as a stimulus to the visceromotor activity of the spinal centres in relation to the abdomen and pelvis.

Immobility of the sacro-iliac joint may be due to one of three conditions: (1) Direct displacement secondary to lesion in the lower lumbar or the lower dorsal areas. (2) Adhesion resulting from disturbed circulation and drainage with corresponding lesions in the lower dorsal (vaso-motor), in the dorso-lumbar (lymphatic), and in the articulation of the leg or pelvis (saphenous). (3) Acute inflammatory conditions as in fibrositis. Whatever the type or cause there is a subluxation of some kind in the sacro-iliac joint and this results in a dysfunction in the joint. Pain indicates partial or complete immobility on one side and overworking on the other. In these cases there is rigidity, and sometimes impaction at 8-10D and in trying to deal with the pain we should remember the sacral soft tissues and spinal centres at and above 9D. The spinal rigidity should be treated by articulation upwards but note there is generally a primary psoas fibrositis, and a failure to maintain equilibrium of the trunk, which is the primary cause of the pain.

To correct these conditions relax and articulate the legs freely; articulate the legs on the pelvis and see that each ligament articulates with equal freedom. Establish mobility in the spine from 10D upwards and correct from 10D downwards including the sacra-iliac articulation.

The sacro-iliac articulations are diarthrodial to permit limited movement of the ilium on the sacrum. The anterior movement is a torsional strain which is countered by a posterior tension strain while the range of movement is limited by the roughened surfaces of the joint the convexity of the one fitting closely into the concavity of the other. If any movement goes beyond the normal the two bones will at once antagonise each other resulting in pain, stiffness and rigidity and this is the starting point of painful conditions in the low back.

The sacro-iliac and sacro-lumbar articulations balance each other in maintaining spinal mobility and this is the foundation of the erect posture. In the stiff and painful back the bones become locked and it is necessary to unlock them by rotating the ilium on the sacrum. Having relaxed the muscles in the spine and the legs the patient is placed on the side, and the operator stands behind. With the upper knee flexed the ilium is rotated forward and the trunk is rotated backward. The operator then fixes this

position from the shoulder and thrusts the crest of the ilium forward and downward. With the patient on the back the knee of the free side is flexed to a right angle and the hip is hyper-extended by a counter pressure over the base of the sacrum. Then pull back strongly with a twisting movement on the sacro-iliac on the opposite side. Treatment with the thigh flexed and the knee in extension will tend to rotate the ilium back at the sacro-iliac through the pull on the hamstrings, producing a twisting strain at the articulation. If the thigh is extended with the knee flexed the rectus femoris and the pull of the Y ligaments on the anterior inferior spine will tend to rotate the ilium forward.

The movements of the sacro-iliac joint are based on the foundation of the pelvic ring: they occur in definite directions and are always limited. The tendency to twist gives rise to greater immobility in the lumbar area than is found in other parts of the spine. If there is abnormality in the trunk, spine or legs, strain will result in the sacro-iliac structures and the sacrum will tend to twist between the ilia. This is the common cause of iliac lesions. Inequality of the movements of the sacro-iliac joints occurs in opposite directions in relation to the sacrum and this indicates that the weight of the body passes through those mobile articulations. In violent exercise the exaggerated stress differs from strain, the latter operating by exaggerated or restrained mobility, the reaction occurring by hyper or sub-movements of the ligaments. In stress the reaction operates in a more static way, the movement being restrained or inhibited or obstructed. In this case the restraint reacts on the sacro-iliac ligaments, the ilium becomes fixed and weight-bearing while the sacrum moves in relation to the spinal column in flexion, rotation, sidebending, etc.

CLASSIFICATION OF SACRO-ILIAC LESIONS

These are of two kinds: those resulting from subluxation of the ilia secondary to conditions involving the feet, and those resulting from subluxation of the sacrum in which the primary condition is in the lumbar region, or some other area of the spine. Here we must take account of the weight and force transmitted from the spinal column through the pelvis to the legs. The shifting of the sacrum, or ilium, resembles a twist in which the sacrum and the symphysis move in relation to each other. The torsion is always associated with anterior or posterior movements of the iliac crests, or, the sacrum is moved in relation to the iliac crests. It is for this reason that the ilia are regarded as wheels in their relation to the pelvic ring, which

rotate upwards and anteriorly, or downwards and posteriorly, when abnormally adjusted. In the anterior rotation, the strain rests on the crests of the ilia, while in the posterior position it rests on the ischia and, in the abnormal, the problem of the relation of the ilium to the pelvic ring depends on this wheel rotation.

There are several distinct physiological movements in the sacro-iliac joints. The primary movements of the sacrum between the innominates is that of flexion and extension and, in the later stages of the lesion condition, the sacrum is either hyper-extended or hyper-flexed in relation to the two innominates. Sidebending, or rocking, of the sacrum functions as a shock-absorber to some extent.

In locomotion the sacrum moves in a superior inferior direction and when unilateral strain is transferred from the trunk to the lower extremity, there is a tendency for it to rock to one side with a downward movement in relation to the innominate. Although sometimes described as an up or down-slipped innominate, there is a distinct downward movement of the sacrum in many cases. Variations of flexion and extension when complicated by abnormal sidebending give a third type of movement in which the sacrum moves within the pelvic ring by torsion or rotation round a vertical axis. In this type of lesion the primary condition is in the upper spine or thorax which causes the strain to pass downward and pass from side to side, first at the lower thorax, and then at the pelvic ring. Mechanically, mobility is impaired by inertia of the sacrum under the weight of the trunk, when some activity such as jumping may cause the descent of the sacrum in relation to both innominates, if they are normal, and with one innominate if they are abnormal.

Torsional lesion of the sacrum can occur from the playing of such sports as golf and riding side-saddle. In the latter case, the left innominate becomes rigid, the right innominate is mobile and all sacro-iliac movement is right-sided. To correct this type of condition place the patient on the face and articulate the right side of the upper trunk and spine. Follow by articulating the left leg in relation to the innominate without moving the pelvis. Then with the patient on the right side articulate the spine downward with arm movement, and the left leg in relation to the pelvis and lumbar. With the patient prone stand at the left side and articulate the right hip, the right sacro-iliac and lumbar using leverage of the right leg, and finally extend the lever to include the left sacro-iliac. Complete the treatment with the patient sitting, using the arm across the chest leverage

while applying resistance with the thumb on the opposite side of the spine in a downward direction.

In some cases of sacro-iliac lesion the muscles are almost entirely at fault. The joint lacks the protection of the muscles as is the case in other parts of the body and the lesioning results from the abnormal twisting in the lumbar and dorsal areas of the spine. In correction, articulation of the spine should be applied from above down and the adjustment is best made with the patient in the prone position using leg leverage on the side opposite the operator. The leg should be lifted as nearly as possible in a straight line and with a gradually increasing rotation brought over the mid-line while the other hand offers resistance at 5L and sacrum. Repeat on the operator's side against resistance over the posterior superior spine of the opposite ilium.

In sprain of the sacro-iliac there is generally an acute or chronic inflammation and, if this continues there will be an immobile articulation on the one side, and a compensatory hyper-mobility on the other. The resultant thickening of the ligaments and muscles in relation to the joint is caused primarily by a fibrosis, and should be treated as such. The trunk weight is supported entirely by the sacro-iliac ligaments, and the bones are protected in that the inflammation settles down in the ligaments, as the condition becomes chronic. Following the ligamentous strain we find periosteal tenderness, with swelling and sometimes adhesion. The strain results in stress, mechanical irritation and thickening, exostosis and adhesion in the auricular surfaces. The result is pain and difficulty in standing or walking. This is associated with a sacrum so misplaced that iliac movement becomes impossible, or, the ilium is thrown posteriorly and becomes rigid.

In the typical lesion of the sacrum there is a combination of flexion, extension and sidebending. The movements occur downwards and forwards. The vertical part of the auricular surface is here involved, and the maximum strain falls on the interosseous ligament, resulting in inflammation, congestion, thickening and adhesion. If the innominate is the original factor the strain falls at the same point and in the same direction, and the only difference is that the lesion becomes a posterior rotated innominate. The anterior innominate lesion is explained by the mechanics of sacral movement. Here the lower sacrum moves forward by rotation, and there is movement along the horizontal limb of the auricular surface. The innominate is behind the lower sacral ligaments and the strain

is on the oblique fibres. This is why it is that if the innominate moves in producing the lesion it moves backwards and downwards, whereas in the anterior innominate lesions the sacrum moves forward, and rotates, while the innominate remains unmoved. Sometimes the two conditions overlap. In some cases the sacro-iliac lesions are compensatory to lesioning in the dorsal or dorso-lumbar, in which there is some change in the gravity posture at 3L, or in the upper dorsal area.

This type of lesion is caused by the inability of the pelvis to resist the abnormal gravitational force from above, and should be treated from above downwards in relation to the gravital spinal centres at 5C, 3-4D, 3L. Where the innominate or the sacrum is at fault, correction must be from below up, beginning at the hip, and the ilia in relation to the sacrum.

In the diagnosis of sacro-iliac lesion, measurement of the legs is of no value for three reasons. (1) Short lower extremity may have no reference to the pelvic condition in which case the pelvic unity is preserved. (2) Comparative leg rotation gives no clue to the condition of the sacro-iliac because the resisting power of the pelvis throws the entire strain on the lumbar area. and, (3) In all pelves which have been subject to abnormal strain for some time there may be a lack of symmetry in the innominates which is sometimes indicated in the position of the anterior and posterior spines. This is the wheel type of rotation and the mobility of the sacro-iliac joints are here diagnosed by comparing each joint with the other.

Correct positioning of the innominates does not prove that they are in normal relation to the sacrum, and the diagnosis must be based on the condition of the muscles and ligaments round the joint, and irregularity of the articulation accompanied by tenderness under pressure. In other words we must discover three points – is the sacro-iliac mobility equal on the two sides; is there acute inflammation, thickening or adhesion in the articulation area; is there muscular or periostial tenderness on palpation?

The anterior aspect of the pelvis cannot be examined for mobility. In the area of the posterior inferior spine of the ilium the ligamentous covering is thin, so that palpation is easy and pressure can be applied to test for movement. Sometimes the horizontal posterior sacro-iliac ligament and, at other times, the lower oblique posterior sacro-iliac ligaments receive the greatest stress. Inflammatory changes follow in both cases. In the prone position the horizontal limb of the auricular surfaces is at an angle of 150 degrees, while the angle of the vertical portion is now 25-30 degrees, each joining to mark an apex pointing downwards to the table. The

posterior-superior and posterior-inferior spines of the ilia are located in the upper angle formed by the two limbs. The interosseous and horizontal sacro-iliac ligaments are located just above the posterior-superior spine at the end of the vertical limb, while the long oblique posterior sacro-iliac ligaments are below the posterior-inferior spine. These are the ligaments which show the greatest amount of change and provide two definite landmarks for the examination of the sacro-iliac articulation.

TECHNIQUE OF CORRECTION

The sacro-iliac articulations represent a unit of movement in the pelvic ring and it is only possible to make proper adjustment by means of similar and simultaneous treatment on both sides. For this purpose four hands are used in order to obtain complete control. With the patient on the side the thighs are flexed on the abdomen with the object of limiting lumbar rotation; this provides the lever and if the innominates are supported the sacrum can be twisted or turned between the ilia. The ilium is grasped by the hand with the thumb at the superior border while the other hand thrusts ventral-ward along the groove of the vertical margin of the auricular surfaces. As the result of this the pelvis will move forward and the sacrum will react by tending to move backward. The action is duplicated by the second operator. The patient's knees are then slowly pulled down while preserving fixation over the ilia; provided the knees are kept together, rotation will occur between the sacrum and the ilium, on either side and, as the legs are straightened into the prone position, the heads of the hips, ilia and sacrum will react on each other. For the next stage of the treatment one operator places the thumb of each hand over the sacro-iliac articulation allowing the fingers to spread over the ilia. The second operator then grips the patient under the arms and slowly lifting the body rotates the shoulders alternately. Still holding the position the first operator then places one hand over the sacrum and, with the knee flexed, rotates each leg strongly in an outward direction. The treatment for the innominate lesion, as distinct from the sacral lesion, is similar but the thumbs are placed over the posterior inferior spines and the leg is rotated externally without flexing the knee. If resistance at the sacro-iliac articulation is very great, thrust with the cushion of the hand over the 5th lumbar as the legs are rotated and allow the patient's body to drop slowly onto the table. Follow by strong articulation of the arms in relation to the ribs and vertebrae downwards along the spine.

THE TECHNIQUE OF RIB CORRECTION

J. MARTIN LITTLEJOHN

A. ANATOMICAL CONSIDERATIONS

The ribs are classified as flat bones, but their function in mobility is determined by considerations which vary for the different groups. The true ribs, ribs one to seven, articulate posteriorly with the vertebrae and anteriorly with the sternum. Each rib is a unit in motion which is controlled by the individual cartilages. The false ribs, ribs eight to ten, also articulate with the vertebrae posteriorly, but, anteriorly, they are united by their cartilages to the cartilage of rib seven, and their mobility is determined by this fact: that is to say ribs eight to ten are accessory to rib seven in mobility and the four ribs are brought together in a single type of movement. The two floating ribs are entirely free anteriorly and their mobility is therefore determined by their relation to the spine at D11 and 12 and L1 and by the balancing action of the lateral muscles. Thus the condition of the abdominal wall and of the spinal muscles is what really determines the mobility of the floating ribs.

In the case of the typical ribs (i.e. those other than ribs one, eleven and twelve), the head of the rib is a wedge with two articular facets which articulate with two adjacent vertebrae. The inferior facet is the larger and articulates with the vertebra corresponding in number to the rib. The neck of the rib is constricted and lies anterior to the transverse process of the corresponding vertebra. On the posterior surface where the neck joins the shaft is the tubercle which supports the articular facet with the transverse process. The direction of this facet is downwards posteriorly and slightly medial. Normally, therefore, the rib cannot slip upwards because the head articulates with the vertebra just above, nor downwards because of the articulation with the transverse process posteriorly and inferiorly. This means that in a displacement of a rib the head and neck must first slip outwards and slightly downwards from the vertebra before it can be displaced either up or down in its relation to the vertebra. This has an importance in correction. The first thing to do is to establish flexibility at the articulation and then attempt to move the rib upwards or downwards as required and to push it upwards and inwards in relation to the transverse process. For example, with the patient lying on his face, use shoulder leverage to establish flexibility in the spine and with the other hand apply pressure on the rib anteriorly, backwards and inwards towards the spine.

The shaft of the rib is a flattened barrel-like structure curving forwards and medially, most acutely at the posterior end. This implies that pressure applied to the anterior ligaments of the rib will always tend to intensify the curve so that when the head and neck of the rib are involved pressure should always be applied first anterior to the angle, but when the angle is involved pressure should be applied close to the tip of the rib, but taking care to avoid the cartilage. When considering the movements of the ribs it must be remembered that the ligaments are the most important structures. The articular capsule surrounds and encloses the joint and is partially formed by the radiate or stellate ligament. This ligament has three bands which radiate from the centre of the rib and pass, one to the body above, one to the intervertebral disc and one to the body below. The inter-articular ligament is short, the fibres extending from the part of the head of the rib which lies between the two facets to the intervertebral disc and dividing the articular capsule into its two parts. The costo-transverse ligaments, anterior and posterior, pass from the neck and tubercle of the rib to the transverse process above along its lower border and to its point of junction with the lamina. The ligament of the tubercle extends from the tubercle of the rib to the tip of its own transverse process.

Ribs one, two, eleven and twelve, which are atypical, require special mention. Rib one is short and flattened horizontally. It articulates with the body of D1 and the tubercle coincides with the angle of the rib. The anterior end is thickened so as to form a solid articulation with the manubrium just posterior to the sternal end of the clavicle. Hence, the concavity of the curve formed by the edge of the rib will not spring as in the case of other ribs. When one end moves the other end moves as well so that it is typical to find this rib displaced both at the head and at the sternal end. Another important point to note is that the anterior and middle scaleni muscles insert into the rib in close relation to the subclavian vessels. When the rib is moved by these muscles an effect is produced on the vessels and a first rib lesion always interferes with subclavian circulation, the vein being most affected because it lies in front of the insertion of the anterior scalenus whereas the artery lies behind the muscle.

There are two points to note in connection with the second rib. First it is affected by the tendency of rib one to be displaced at both ends and secondly the sharpness of the curve and the flatness of the body antero-posteriorly gives it an upward and outward direction, the attachment of the scalenus posterior being at the most lateral portion. Ribs one and two are thus balanced between the anterior and posterior scaleni with the middle

scalenus producing added force on rib one. Rib eleven is short and has a regular curve which almost obliterates the angle. Rib twelve is shorter still and has no angle at all. The balance of these two ribs is effected through the quadratus lumborum muscle.

B. THE PHYSIOLOGY OF RIB MOVEMENT

The first rib is practically immobile, and it is placed at an angle which is directed slightly downwards and forwards so as to form a fixed line from back to front towards which all the other ribs may be lifted upwards. On this principle the head and articulation of rib one represent the fixed point of upward thoracic movement. Therefore, when we are dealing with the entire thorax and attempting to articulate by lifting it upwards the head of rib one should be made a fixed point at and over which pressure is applied. Also, in using the arm as a lever as against this fixed point the arm should be lifted first at right angles to the body and then moved upwards above the head and slightly outwards, increasing the outward movement as the arm moves upwards.

It should be noted that the other ribs are all directed obliquely downwards, the obliquity increasing from above downwards, so that the anterior extremity of each succeeding rib is a little lower than its posterior extremity by comparison with the rib above. Hence in dealing with the ribs below rib one instead of elevating the arm forwards at a right angle, elevate it forward and slightly downwards, so that from rib to rib the angle will be becoming more acute. Then, with pressure at the corresponding rib head, bring the arm upwards above the head and outwards as indicated above. It should be noted that the arches formed by the ribs widen in regular progression from above downwards, especially in the upper part, so that the transverse width of the thorax attains its maximum opposite rib eight or nine or at the level of the articulation between them.

It may, therefore, be said that the thorax is divided into two parts, the dividing lines being the intercostal muscle connection between ribs eight and nine, which in turn implies that, if the thorax is normal, elevation and expansion should take place in two sections, namely above and below rib eight. This explains facts with which we meet in practice; lung conditions, including bronchial conditions, involve the section down to rib eight, while liver, spleen and sometimes stomach conditions, especially when these concern the cardiac orifice, involve the part of the thorax from rib nine downwards. It should be noted that D9 is an individual key vertebra in the

spine and represents the division between two curves of the spine and between the two sections of the thorax.

When we consider the attachments and construction of the ribs we see that two chief types of movement are exhibited. The “pump handle” type of motion can be analysed as follows. The heads and tubercles of the upper ten ribs articulate both with the body and the transverse process of the vertebra, each rib having its own two points of articulation. This means that the posterior axis of rotation must pass through these two points. The line between these two points gives us an angle of forty-five degrees with the body of the vertebra and movement takes place posteriorly, laterally and downwards. The plane of rotation around this axis must be at right angles to it and is therefore directed forwards, laterally and downwards and the movement of each one of ribs two to ten as a whole must, if normal, be upwards and outwards with an eversion of the lower border anteriorly and the upper border posteriorly.

Since ribs two to five slant downwards and forwards directly to their sternal attachments, the sternum must be raised when the ribs are raised, and because the manubrium is practically immobile in ordinary respiration, the body of the sternum must be bent at its junction with the manubrium. In this way both diameters of the thorax are increased and the play of the thorax in respiration rests with ribs two to five, especially when respiration is stronger than normal. On the other hand, when thoracic breathing is limited, as in asthma and its complications, ribs two to five are more or less rigid. The other or “bucket handle” type of movement arises as follows. All but the lowest two ribs are joined to the sternum, either directly or indirectly, by thin cartilages and the axis of rotation, entirely outside of the rib field, must be found at this junction. This axis of rotation is cartilaginous and the direction of it varies, being almost horizontal at the upper costo-sternal cartilages but increasing in its angle from above downwards until it reaches one hundred and forty degrees in the case of the part of the common cartilage connecting with rib ten. The lower ribs (six to ten) are so arranged that the cartilage of each one moves outwards laterally and anteriorly to a greater extent than the one immediately above during inspiration, thus increasing all the diameters of the thorax. There is also an eversion of the lower border anteriorly and of the upper border posteriorly. Hence, when we apply pressure anteriorly in connection with elevation of the thorax or ribs we should apply it over the anterior part of the rib in the case of ribs two to five but over the corresponding cartilages in the case of ribs six to ten. The pump-handle movement can be seen

to be typical of ribs two to five and the bucket-handle movement of ribs six to ten.

Certain muscles are of mechanical importance in lesions of the ribs and thoracic cage. Unilateral contraction of the semi-spinalis capitis tends to pull the head towards that side and this causes a lesion of C7 in relation to rib one. This in turn causes irritation and contraction of the muscle with a secondary lesion of the occiput, posterior on the same side, and of the atlas with its transverse process back on the opposite side and an interference with the relationship of the occiput and the axis through the odontoid process. The scaleni muscles are always involved in lesions of ribs one and two, the contractures being either primary or secondary to the rib condition. Secondary to such a condition of scaleni and ribs one and two we find lesions of C3, 4 and 5. This type of lesion complex is the cause of most of the forms of torticollis or wryneck. Contraction of the serratus posterior superior can be either primary or secondary when there are lesions of ribs two to five, and in many cases also lies at the foundation of torticollis, especially if arm leverage was a feature of the original trauma. Contraction of the serratus anterior may be associated with lesions of ribs three to five and there may be a secondary acromio-clavicular lesion produced by strong traction on the scapula which is rendered rigid. Lesions of ribs three to seven or eight may cause contracture of the pectoral muscles with traction on the scapula and torsion of the acromio-clavicular region. In such a case it is advisable first to relax tension in the axillary region, to follow this by articulation of the arm against the resistance of solid pressure of the hand over the acromio-clavicular region while attempting to raise and rotate the arm at the shoulder, and finally to relax and articulate the ribs.

The latissimus dorsi muscles are primarily involved in lumbar and innominate conditions, but it should be noted that there is a secondary reaction on the shoulder in connection with the acromio-clavicular articulation. Thus, reaction always operates on the shoulder of the side opposite to the lumbar lesion, that is, on the side opposite to that to which the S.P. deviates. In attempting to correct the lumbar lesion place the patient on his side with the involved shoulder upwards, grip the spinous process of the involved lumbar vertebra with one hand and place the other hand in the anterior of the axilla. First push up and back on the shoulder at the same time as making a pushing movement with the fingers in the lumbar region, and then quickly change the position of the fingers so as to be able to give a pulling movement while pushing upwards and forwards

under the axilla. It is through contracture of the subclavius that a first rib lesion can affect the clavicle, but it will often be found in these cases that the original trouble is in the sterno mastoid muscle and the head will be found pulled down on that side with the chin pointing to the opposite side. In dealing with this situation place the patient on his back, relax the neck muscles and rotate the cervical region away from the side of contracture, then attempt to lift the clavicle while pressing downwards on the first rib, and finally articulate the arm and try to get movement of rib one lifting the clavicle at the same time. The fibres of the quadratus lumborum are inserted into ribs eleven and twelve and consequently the muscle is always involved in lesions of these ribs, and it must be relaxed on one side or both to obtain correction of the ribs. This can be done with the patient either prone or supine. In the first case, the leg is brought into straight extension followed by rotation upwards and outwards with counter pressure at the head of the rib in an outward direction; in the second case, by flexion and rotation of the leg or by a push and pull movement on the innominate bone in all cases against counter pressure on the rib head as before.

Rib lesions often exist as part of a thoracic condition. The thoracic cage constitutes an unit but if this unity is disturbed so that the upper and lower halves function separately, the reaction settles down in one particular rib, most frequently the fourth or fifth, and it is for this reason that we often find a chronic lesion at this level. However, ribs also operate as separate units in thoracic and trunk movements and, as such, are liable to misplacement; but, in this case, the starting point of the condition is always in the spinal vertebrae. In the average type of chronic rib lesion there is a vertebral lesion behind it and rib lesions must be regarded as maladjustments of ribs on vertebral articulations. The primary cause of these lesions is perverted physiological movement, either within the cavities of the body trunk or in the arches of the spine. This suggests that rib lesions as such are not displacements resulting from vertebral subluxation only, but must be regarded as modifications in the articulation of the rib through its head with the vertebral column.

Each typical rib articulates with two vertebral bodies and one transverse process, the two vertebrae involved being the one with the same number as the rib and the one above it. For example, a lesion of rib four implies a disturbance of D3 and 4. It should be noted in the case of this particular lesion that this is the field connected, via the S.N.S., with correlation of circulation all over the body which may partly explain the frequency of the lesion. The transverse process involved is that of D4 and it is probable that

in the development of a rib lesion the first modification of articulation is in the relation of the rib head to the transverse process. This implies some sort of rotation in the vertebra corresponding with the rib in nearly all cases. There is a well-formed capsule at both points of rib attachment, namely both where it attaches to the vertebrae and to the transverse process and, in addition, there is a ligamentous attachment which gives two-fold strength to the whole articulation. Thus, at the body attachment, we find the strong stellate ligament which is generally formed in three parts, one going to the vertebra above, one to the disc and one to the vertebra below. The interarticular ligament extends from the ridge at the head of the rib across to the disc and divides the cavity space into two parts, each of which has a distinct synovial membrane.

In the case of the first, tenth, eleventh and twelfth ribs which articulate with only one vertebra, this division is absent and there is, therefore, only one synovial cavity. This is why dropsical effusion often appears in relation to these ribs, especially ribs ten to twelve, rib one being less liable to it because it is stable. In pleuritic effusions, for instance, ribs ten to twelve are always seriously affected by dropsy, and in dealing with pleuritic conditions it is important to see that these ribs are free at their articulations with the spine.

The most complete attachment of the rib to the spinal column is that of the rib head to the transverse process and, therefore, before trying to correct a rib lesion it is important to see that there is no rotatory lesion of the corresponding vertebra and, in any case, one should freely rotate the vertebra to release the transverse process and prepare the ground for the correction of the rib lesion. Moreover, since, in addition to the capsule limiting the range of motion, there are costo-transverse ligaments which lie between the rib and adjacent transverse processes, we should also articulate the vertebrae above and below so as to secure relaxation of the interlacing ligaments. The mid costo-transverse ligament extends from the rough surface at the back of the rib to the front of the transverse process and this can only be relaxed by traction extension of the spine which should thus also be given in preparation for rib correction. The posterior costo-transverse ligament which is attached to the apex of the T.P. and runs to the tubercle of the rib can only be relaxed by diagonal stretching of one side of the thorax. This can be done by placing the patient on his side with the involved rib uppermost and applying diagonal stretching treatment down to rib five, with pull or push movement on the shoulder and vice versa at the rib. In the treatment of ribs below rib six give similar pull and push as

between the innominate and the rib. The anterior costo-transverse ligament attaches the upper border of the neck of the rib to the lower border of the T.P. above it. In palliative treatment and preceding rib correction this can be relaxed by placing the patient supine and lifting the ribs by arm leverage and then applying a pull and push movement to ribs which resist, working from the angle to the head of the rib.

The serratus magnus gives a fastening grip on the upper eight or nine ribs and the levatores costarum give a similar grip from the transverse processes to the rib immediately below; internal and external intercostal muscles connect the ribs with one another over their entire lengths. The final preparatory treatment to correction of ribs should deal with these muscles which can be done as follows: First, with the patient on his side facing the operator, the operator should put one hand on the innominate and the other on the shoulder and give traction extension treatment. Secondly, with the patient supine, use the arm as a lever while putting the fingers of the other hand in at a point midway between the head and the angle of the ribs and push upwards while the arm is above the head. Finally, fix the solid part of the hand on the table and hold the ribs while bringing the arm down, repeating several times for each group of ribs until relaxation is secured. Such preparatory movements should be carried out before trying to correct any chronic rib lesion.

It is important to remember that the heads of the ribs are connected so closely to the vertebrae that only a slight gliding movement is possible. This movement is controlled by ligaments which bind the ribs to the transverse processes. In the case of ribs one to six the articulating surfaces on the tubercles are oval and convex from above downwards, thus fitting into the corresponding concavities on the anterior surfaces of the transverse processes. This means that upward and downward movement of the head of the rib is only possible in combination with rotation on its long axis. Ribs seven to ten, on the other hand, articulate on a flat surface and this gives the rib an oblique, out and back movement, the surface with which it articulates being on the upper margin of the transverse process. In movements of the rib the tubercle is drawn up and carried backwards. While in rib movement there seems to be a double movement, costo-central and costo-transverse, there is for practical purposes a single articulation with movement up and down. In the case of ribs one to six the movement is a rotation, but in the case of ribs seven to ten the neck of the rib moves up and back and rotation is practically non-existent. So while the movements of the ribs are said to be along two axes, the real articulation of the rib with

the transverse process is a single articulation with a movement which is rotatory in the case of ribs one to six and simply upward toward the upper thorax in the case of ribs seven to ten.

Lesions of the ribs fall into three main types. In the first type all the ribs are involved, this really being a lesion of the thoracic cage of which the ribs are units; in the second type the ribs forming the cage are divided into two sections with lesions corresponding to this condition; in the third type there are individual lesions. In connection with the first type it should be noted that the ribs normally move so that the antero-posterior lateral and vertical intra-thoracic diameters are all increased, the diaphragm being the principal activator of the process. Rib one may be regarded as a point of general fixation and the effectiveness of all rib movements below depends on the support given by this rib. Ribs one and two are supported from above by the scaleni muscles and are so connected with all the cervical vertebrae except C1 and 7, so that when the upper part of the thoracic cage is involved C2 to 6 can be expected to be in lesion.

The muscle attachment is to the transverse processes and as the curve of the cervical spine is ventral the muscles descend almost vertically to their points of attachment on the outer margins of ribs one and two. The anterior and middle muscles insert towards the anterior end of rib one and the posterior muscle inserts into the outer margin of rib two at the middle of its shaft. The scaleni in cross section are almost equal to the biceps brachii in cross section and this gives the cervical region in relation to the upper thorax a balancing and correlative strength as against biceps action in the arm.

The scaleni operate in two directions and ways. First, they limit depression of ribs one and two in the face of muscle pull from below and, secondly, they have power to overbear the influence of the lower muscles and to elevate the upper part of the thoracic cage if stress is transmitted from below. Correlation is thus secured between the diaphragm at the lower end of the thorax and the fascia of the lower cervical area in relation to action of the scaleni. This interaction is the foundation of all inspiratory action by the thorax as a whole. Hence correction of conditions involving the ribs, especially ribs one and two, when the whole cage is involved should be undertaken in the following manner.

First, relax the neck downwards, especially articulations of C2 to 6, and relax muscles and fascia downwards in the neck and also the diaphragm, especially in relation to the lower dorsal area and the splanchnic nerves.

Secondly, apply extension to the thorax by traction on the head and neck against the resistance of the thorax, asking the patient to breathe deeply while increasing the traction. Thirdly, use thoracic pump treatment, beginning by lateral pressure before using anterior pressure. Fourthly, standing at the head of the table with the patient supine, pull on the lower ribs while the patient breathes deeply. Follow this by steady pressure with the cushions of both hands over the upper ribs just below the clavicles while the patient breathes. Fifthly, with the patient sitting stand behind and lift each rib separately by lifting the shoulder with one hand while passing the other hand under the axilla and across the patient's chest. Sixthly, with the patient sitting place a knee in his back and apply backward bending to the thorax against the knee, increasing the extension as the patient breathes deeply.

With regard to the movement of the ribs it should be noted that rib one is limited to a "bucket handle" movement, but that all ribs below one and two have a "pump handle" movement and a "bucket handle" movement, the anterior end of the rib representing the end of the handle in the first case and the centre of the body of the rib being the centre of movement in the second case. Therefore, in the thorax as a whole, ribs one and two go through the bucket handle movement while those below are performing the pump movement. This implies that strain on ribs one and two tends to be at the centre of the body of the rib, but on rib three downwards the strain falls mainly on the sternal end. Balanced movement of the thorax as a cage or unit depends on co-ordination between these two types of movement and this is maintained almost entirely by contraction and relaxation of the external intercostals. Also, it should be noted that the maximum range of costal movement never raises the rib to a right angle with the long axis of the vertebra and the balance of bucket and pump handle movements is at the centre of the shaft of the rib so that, in normal circumstances, there is never a drag between the two ends of the ribs at any point.

Rib nine calls for special mention on account of its connection with the ninth dorsal vertebra which is a key vertebra working alone in normal spinal articulation. When this rib becomes rigid the correlation between the scaleni and the intercostals is disturbed, and the result, if the condition continues, is elevation of the anterior end of rib nine with an increase of the anterior-posterior diameter of the thorax at this point. This is the lesion condition which we find when the ribs below nine project anteriorly and are out of balance with the ribs above and in these circumstances both the scaleni and the external intercostals are contracted.

The treatment in such cases should be the same as that outlined above with additions as follows: Articulate rib nine with the patient supine, using arm leverage. Follow this with relaxation of the rib, pulling the arms strongly above the head one by one and asking the patient to grip something, such as a stick in the hand. Then while the patient breathes deeply about six times, stand at the side and place the thumbs at the sternal ends of the two ninth ribs with the fingers going back over the angles and apply strong backward pressure over both ribs while the patient inhales, relaxing it while he exhales. Similar treatment may be applied to rib ten. In the case of ribs eleven and twelve place the thumbs at the heads of the ribs with the fingers forward and give similar treatment followed by thoracic pump treatment with pressure over the upper abdomen.

It should be noted that each rib from the first to the ninth has a more marked inferior curve postero-anteriorly than the one above. The result is that as the external intercostals contract, the interval between each rib is diminished, and all the bucket handles are elevated together in a co-ordinated manner, increasing the lateral intra-thoracic diameter. Therefore, in lesion conditions of ribs three to eight lateral thoracic pump treatment should be given in place of the special treatment for ribs nine downwards outlined above.

Another important point about rib mechanics is that extension of the dorsal spine takes place with every inspirational movement of the thorax. This extension is important because it allows a wider supero-inferior range of movement for the thoracic wall in front. Hence, when dealing with impacted ribs or contracted conditions of intercostal muscles, the first treatment of all to be given should be traction-extension to the dorsal spine. This should first be given with the traction applied to the head and neck, followed by leverage under the shoulders. Complete with inter-vertebral articulation from D9 to the occiput and intercostal movement with arm leverage accompanied with gradually increasing deep breathing.

The other key to thoracic movement resides in the diaphragm. The crura which constitute the chief part of the muscle tissue originate from the bodies of L1 to 3 and the nerve supply is furnished by D11 and 12 and L1 and 2. The muscle tissues depend for their proper functioning on their intrinsic tone. Hence, in correcting thoracic cage conditions originating in the lower ribs, first relax the lumbar region from below upwards, articulating thoroughly from L3 to D9, before embarking on the general and special rib treatments indicated in the particular case.

In those cases in which the thorax is divided into two sections, if an individual rib in one of the sections is involved it should be treated as a single or individual rib lesion. On the other hand, if an individual rib lesion is really a manifestation of a sectional division of the thorax into two parts, the first thing to do is to correct the thorax and restore it to its normal form as a cage. This should be done by first relaxing the neck downwards and the clavicle and the abdomen and then articulating the ribs of the upper section, using arm leverage and beginning with the ribs at the bottom part of the section. After this the individual rib can be dealt with as follows: First apply pressure at the sternal end of the rib, then fix the head of the rib by pressure of a thumb or finger using the other at the angle in such a way that when arm leverage is applied the angle is elastic and the head fixed. Follow this with forger and thumb pressure at the angle combined with arm leverage, gradually widening the distance between finger and thumb. While doing this apply pressure superiorly or inferiorly on the rib according as to whether the rib is dropped or elevated. Finally, using arm leverage articulate the ribs upward or downward to the rib in lesion, beginning above in cases of an upper rib and below in cases of a lower rib.

INDIVIDUAL RIB LESIONS

(a) *Ribs One and Two.* These ribs, and especially rib one, are peculiar in their attachments because they lie more or less flatly so that they can act as a roof to the thorax. Also, three important muscles, the three scaleni, are attached to them, having their origins from the transverse processes of the cervical vertebrae and their insertions on the outer and upper surfaces of the two ribs. Normally, therefore, the range of movement is upwards and it is possible to raise rib one merely by inclining the head laterally towards the other shoulder thus putting the scaleni on stretch and pulling the rib. It is often possible to correct rib one by this movement alone placing the fingers along the rib to guide the corrective movement. In addition, in the case of rib two, this movement can be used in conjunction with a right angle lifting of the corresponding arm and rolling of it slowly above the head. At the end of this movement the arm should be brought straight down and not rotated in a circle downwards and outwards.

Also in diagnosis of a lesion of rib one it is best for the operator to place his hands on the patient's shoulders so that the third fingers lie along the clavicles and the second fingers fall naturally onto rib one. In this way a comparison can be made of the two sides. If the lesion of rib one is

associated with lesions of the mid or upper cervicals these should be corrected before an attempt is made to correct the rib.

The cause of the rib lesion is usually a dragging pull on the rib by which it is held at its upward limit of movement. Therefore, the first line of treatment should be to stretch the tissue involved in the dragging and get rid of contracture. This can be done by placing one hand firmly on the most prominent point of the rib while bending the head of the patient over to the same side with the other hand and then rotating the head gently. All the while the pressure should be maintained on the rib so that the tissue is thoroughly relaxed. After this there should be a thorough relaxation of the neck downwards and of the whole interscapular area in order to free blood and nerve supply, get rid of contracture and guard against recurrence of the lesion.

In dealing with rib two the same procedure can be followed with the finger on rib two instead of rib one. This can be followed by springing the upper ribs with the patient sitting on a stool and the hand of the operator on ribs one and two with the thumb close to the articulation with the transverse process. Then the operator should place his other hand on the patient's head and rotate it round to the side of the rib in lesion thus causing the tension to disappear. Then with the patient sitting on the table carry one arm across his chest so that the hand is placed on the root of the neck anteriorly and place the other hand on the head and move the head and neck at the same time with a push and pull movement. This will tend to make the neck lift ribs one and two especially if the head is extended backwards while a pull is exerted on the lower neck anteriorly. Finally there can be further springing from D5 up to C5 or 6 with one arm across the patient's chest and the thumb of the other hand pressing at the transverse processes.

(b) *Ribs Four to Eight.* In this area a lesion of a rib is usually a slight upward rotation, that is to say, it is held slightly in the inspiratory position. We have here a lesion of tension, the tension of the surrounding tissues preventing the rib or ribs from keeping in normal correlation with the other ribs and holding them in a twisted position. In a typical case there will be a prominence of the rib in the mid-axillary line, and, in chronic cases, also at the angle, with tenderness at the articulation with the transverse process. It is this which gives rise to neuralgic conditions in the intercostal muscles, and, in the chronic stage, tenderness will appear at the costal end of the rib. In correction of a rib in this area first correct the

vertebral condition and, even if there is no vertebral lesion, articulate the vertebra corresponding to the rib and the ones above and below. Then try to spring the rib articulation by forcing the rib to go through its normal range of movement. This can be done by placing the patient in the prone position, standing on the side remote from the involved rib and using a downward drive on it. Place the eminence of one hand close to the S.P. Just below the level of the vertebra which articulates with the rib involved, then place the other hand firmly on the rib so that the ball of the hand is on the angle. By an antagonistic movement of the two hands, the hand near the spine pushing upwards towards the T.P. and the hand on the rib pushing downwards, and giving a strong thrust drive, the rib can be made to slip gently into its normal position. After this the patient can be placed in the supine position. Then, standing again on the side remote from the rib involved, insert one hand between the rib and the table, at a point between the angle of the rib and the spine, the hand being clenched so that the rib can rest on a solid support. Then taking the patient's elbow in the other hand and supporting it against the chest give a strong drive, using the elbow as a lever, causing a springing of the involved rib or ribs against the clenched hand in such a way that the ribs are driven towards the transverse processes. Follow this by gently moving the elbow of the patient upwards above the head and rotating it back and downwards into normal position.

In dealing with the middle group of ribs a free range of movement must be obtained at their articulations. There are various methods which can be employed to this end. One method is for the patient to sit on the table with the operator sitting beside him facing in the opposite direction. The operator passes his arm round the patient and gets a grip on the rib immediately below the one in lesion. Then while the patient breathes deeply his arm should be moved up and back in a circle and at the same time an effort be made to hold down the whole group of ribs below the lesion. This can be repeated several times and if unsuccessful the same thing can be done with the grip on the rib in lesion.

Another method is to stand behind the patient seated on the table and place one hand on the shoulder of the side opposite to that of the lesion with the thumb passing over the spinous processes onto the part of the lesioned rib just outside the T.P. While holding this hand firmly in position carry the arm on the lesioned side up and round in a circle and, while doing so, give a continuous jarring movement to the arm with jerking if this seems necessary, all the time maintaining deep pressure on the rib with the thumb. A third method is to place the patient in the prone

position and ask him to raise his body on his elbows so as to “bow” the lower part of the back. Then standing on the opposite side to the lesion place one hand on the lower group of ribs below the inferior angle of the scapula and the other hand on the nearer of the two knees. Then ask the patient to use the toes to lift up the lower part of the body the result of which will be to produce a swaying of the body of the operator from side to side as the hand on the patient’s knee is raised and lowered. After two or three sways a thrusting drive down towards the table can be given by the hand which is on the ribs. The patient will probably drop as the thrust is received and the jerk will tend to restore the ribs, but the process can be repeated at another treatment if necessary.

(c) *The lower Ribs.* Sometimes ribs eleven and twelve are depressed so that their extremities point more towards the crest of the ilium than is normal, but it is more common to find them held upwards. As the ribs are buried very strongly in the abdominal muscles and united to one another by the intercostal muscles first see that the entire thorax is loosened from above downwards, using arm leverage. Rib twelve has the quadratus lumborum attached to it and this muscle is also attached to the lumbar transverse processes and to the crest of the ilium, and in these lower rib lesions there is congestion and contraction of the muscles which explains the extreme tenderness found at the tips of the ribs. Also associated with these lesions, there is a deep pain and congestion in the iliac fossa.

It follows that the only way to deal with lower rib lesions is to relax tension in the muscles, and especially in the quadrati, and to follow this by using tension on the muscles to correct the rib articulations. To do this place the patient on his back with both legs flexed and fix one arm under his flexed knees so as to be able to use them as a pump-handle lever in connection with the body. Then carry the legs round in a semi-circular rotation and, while so doing, work deeply in the tissues, beginning immediately below the rib and working down to the crest of the ilium. Continue this until the rib begins to be mobile. If, after the quadrati are relaxed, the contraction of the intercostals continues, use the same pump-handle leverage with the flexed legs and, with the other hand stretched across the body, grip the ribs just medial to the angles working from rib five downwards, and, while throwing the legs away, pull on each rib in turn. The thumb can be placed on the free ends of the ribs below the ensiform cartilage and a push be given to them at the same time as the pull is made by the fingers. This is the line of treatment to be followed in bringing out ribs eleven and twelve when they have moved inwards abdominally.

The follow-up treatment in dealing with the ribs generally should consist of rib raising. For example, with the patient lying on the right side, the operator can pass his left arm under the patient's left arm while using the other hand to pull directly on the ribs, first from the angles and then on the heads. The ribs can be worked on first individually and then in groups of two or three from above downwards. This can be followed by similar treatment to all three groups of ribs from below upwards using arm leverage. Note that in dealing with all lower rib conditions the diaphragm must be taken into consideration so as to obtain increased intra-thoracic space and movement. There are some types of case in which this is very important because the central part of the diaphragm is fixed to the pericardium and eleventh and twelfth rib lesions especially can cause trouble in connection with the heart. The central point of the diaphragm is relatively fixed and the contracting musculature passes from the central tendon laterally and downwards to the margins of the thoracic cage. This gives us a definite structural arrangement which we can use to expand the upper abdomen with the aid of leg leverage.

One hand should be laid solidly on the lower abdomen while the other hand is used to give flexion and rotation to the legs. The treatment should be accompanied with deep breathing on the part of the patient. It should also be noted that movements of the lower ribs have a definite relation to lymphatic circulation and therefore thoracic pump treatment should always be given to promote free movement of lymph, freedom of the fascia in the lower neck and the elastic reaction of the diaphragm. Another important point is that in connection with all movements of the lower ribs the superior-inferior rib movement is determined by alternate extension and flexion of the dorso-lumbar spine. This explains why in all cases of lower rib lesioning the dorso-lumbar spine is rigid, and why there may also be a sort of impaction of the lumbo-sacral spine. Therefore, before attempting to correct lower ribs, the lower dorsal, lumbar and sacral spine should be dealt with. Correction of the ribs should also be followed by treatment of the dorso-lumbar spinal region by traction and alternate extension and flexion. The patient should also be made to exercise every day from the standpoint of extension and flexion of the spine.

DIFFERENTIAL DIAGNOSIS AND OSTEOPATHIC TREATMENT OF SHOULDER CONDITIONS

T. EDWARD HALL

In this lecture it is not my intention to roam over the whole field of fractures, dislocations and other gross injuries which can happen to the shoulder joint. I shall be concerned mostly with the shoulder conditions which are met with, and are capable of being dealt with, in normal office practice. Gross fractures and dislocations generally require surgical interference and/or anaesthetic reduction. In the case of fractures this is obvious, but it is also true more often than not in the case of gross dislocations, especially if these are of the "button-hole" type in which the capsule is penetrated, with partial or complete rupture of the tonal or rotator-cuff muscles and tendons, including the long heads of the biceps and triceps. These gross conditions can lead to severe nerve and/or vascular injuries and are best dealt with institutionally.

Moseley makes the thought provoking statement that "dislocations and subluxations involving the glenoid-humeral joint exceed those of all the other articulations of the body considered together". The shallow articular surface of the glenoid cavity, with the humeral head contacting it by only a third of its surface, and the slack capsule, encourage subluxation and dislocation, and the joint depends for stability mainly on its muscular attachments. Another strange point which I feel should be mentioned is that, while there is much to be seen in text books and modern literature on the various anterior dislocations and their treatment, up to a few years ago there was little information to be had on posterior dislocations. This may account for the fact that posterior dislocations are almost invariably overlooked at the initial examination, and treatment prescribed for, say, periarticular arthritis and/or adhesions. If this kind of wrong treatment is allowed to go on for four or more weeks then, even if reduction is successfully obtained under anaesthetic, it is not likely to be retained. The X-ray which I show you now illustrates such a mistake in diagnosis which has resulted in a disability which is likely to be permanent because, though it was possible to reduce the dislocation, the reduction could not be maintained. In my opinion such mistakes always arise from ignorance or conceit unless they are due to excessive haste or fatigue. This is a sobering thought.

Fortunately, these posterior dislocations are comparatively rare, and I have only seen two in thirty years of practice, but when I was called upon to deal with one of them, six or seven years ago, I combed all my text books for information and found the only real help, at that time, in Sir Astley Cooper's book on *Fractures and Dislocations* which was published in 1801. This book did give help in respect both of treatment and prognosis but, even today, there seems to be little else. The method of reduction which I found most effective in these cases was "direct pressure by the thumbs on the posterior of the head of the humerus, plus axial traction with the elbow flexed to a right angle, breaking fixation by external rotation and finally reducing the dislocation by the co-ordination of direct pressure and axial traction plus internal rotation still under strong traction". In the case which I have shown you, the reduction could not be maintained though it was followed by fixation for a time by the use of elastoplast and plaster of Paris. If maintenance cannot be secured surgery is the only alternative but there is a strong argument for leaving things alone unless there is excessive pain.

Even today, most methods of reduction of shoulder dislocation are based upon methods attributed to Hippocrates and Galen. Certain modifications were put forward in the eighteenth century by White and La Mothe (1764-85) and in the nineteenth century by Anger, Hamilton, Malgaigne, Lacour and Kocher. Kocher's method seems to have survived as one of the best for reducing anterior dislocations, and has been advocated and used in the twentieth century by Bohler, Eicholtz, Moseley and most other manipulative orthopaedic surgeons. This method appears to be based on the exhaustion of the subscapularis muscle but only after release of the long heads of the biceps and triceps. Reduction can be, it is said, accomplished without anaesthetic; but when I watched Eicholtz in Vienna, many years ago, the patient did not seem to enjoy it much. Bohler says that the method should never be used for downward dislocations but only for anterior displacements, and that the infraspinatus, the opponent of the subscapularis, must be strengthened as much as possible.

I personally have never used Kocher's method and prefer the Hippocratic method which is frequently attributed to Astley Cooper. This method is more direct, simple and successful in 90 per cent of cases, and relies, as you know, on axial traction with the heel of the foot in the axilla and with eversion and plantar flexion of the foot against the head of the humerus so as to push the head up, back and laterally, external rotation being applied to the humerus at the same time. The knee can also be used to aid

replacement instead of the foot. After reduction, treatment consists of fixation in a position of adduction and internal rotation for ten days or so followed by appropriate active exercises.

I have said enough about these gross conditions for we, as osteopaths practising in this country, find ourselves more concerned with painful conditions of the shoulder which, in effect, influence the normal functional mechanism of the shoulder girdle itself and its important relationship with all its adjacent structures. Angus C. Cathie in a series of splendid articles on this area of the body, following extensive research at the Philadelphia College of Osteopathy, frequently expresses his astonishment that the importance of general posture in shoulder conditions has not been stressed sufficiently and is, in fact, generally ignored.

He thus describes the significance of postural relations from the point of view of applied anatomy. "The upper extremity is suspended from the cranium and spine by four muscles; the suspensory muscles of the shoulder, namely, the trapezius, levator scapulae, and the two rhomboids. It is further connected to the spine, pelvis and thorax by the latissimus dorsi. It is attached to the antero-lateral chest wall by the pectoral muscles, the subclavius, and the serratus anterior". We must visualise these as the extra-articular muscle groups functioning around what we may call the intra-articular group, i.e. the conal or rotator cuff muscles which are attached to the capsule, and we should then have a clear picture of the complicated mechanism which makes up the glenoid-humeral articulations and affects posture in general. In his summing up Cathie suggests that we should all be clear on the following seven points when considering the shoulder joint:

1. The upper extremity is a suspended structure peculiarly predisposed to the effects of gravitational forces and postural changes.
2. The shoulder joint permits all types of motion including circumduction and axial rotation.
3. It is acted upon by the muscles directly connecting it with the head, the entire spine, the pelvis and the thorax.
4. It depends for its position upon spinal and thoracic integrity.
5. It is supplied by nerves coming from the cervical and upper dorsal region.
6. It is associated with a transitional area of the spine, the cervico-dorsal, where a freely movable region meets one of greater resistance.

7. In general “poor posture” the shoulders are drawn forward and inward (round shoulders) and in this position there is often pressure on the antero-inferior part of the glenoid lip.

Any examination of a patient for pain involving the upper extremity should always be made with three things in mind.

(1) pain resulting from referred or reflex nerve action as from the cervico-dorsal region (brachial plexus). (2) Indirect trauma affecting the connecting muscles and tendons and including lesions of the acromio-clavicular articulation, supra-spinatus bursitis, biceps tendon trouble, etc. (3) Direct trauma leading, as an end result, to capsulitis of different degrees from minor inflammation to the degenerative adhesive “frozen shoulder”. Such conditions may be the after effects of fractures and dislocations but are not necessarily so. The majority of office practice cases fall under one or more of these headings, though there are, of course, many more factors which can give rise to pain in the shoulder.

Some time ago I attended a lecture on “Differential Diagnosis of the Brachial Plexus” and the lecturer listed fifty-six different possible causes of pain in the shoulder on the blackboard, and explained them all in half an hour. I have no intention of doing this, but a thing which I have found of great help in differential diagnosis is whether the patient first of all complains of a pain in his arm or hand or in his shoulder. If his first remark is of pain, tingling discomfort or burning sensations in the forearm, wrist or hand and secondly only over the shoulder, then I think, all other things being equal, we are entitled to list the case under the first heading, because there is obviously some osteopathic pathology in the cervico-dorsal area, including the upper ribs. Osteopathic lesions of long-standing or severity which are interfering with the continuity of the nerve and blood supply from this area give rise to conditions which are covered by such terms as acro-paraesthesia, brachial neuritis, neuralgia, etc. Arthritic and endocrine changes may influence and ‘or accompany these particular complaints, but in any case they have a strong tendency to appear in the forty to sixty age group.

I would like to take this differentiation a step further. If a patient comes in complaining of slight pain in the shoulder but concentrates more on telling me about how certain fingers, or sometimes all the fingers, go cold and then numb, with a tingling sensation in them which eventually develops into the old familiar “pins and needles”, and if too there is evidence of loss of tactile sense so that he or she cannot hold an object like

a needle for long because of loss of tactile contact, though the grip may not be affected, then. although there may be some pain referred over the shoulder joint and slight limitation of movement in one or more directions which. however, seems to be due to reluctance to use the shoulder fully rather than localised trauma, I usually find that I have to deal with a condition arising from the mid and lower cervical area. X-rays in these cases will usually provide evidence of osteo-arthritic changes.

On the other hand, if the patient is concerned more in complaining of a pain which is mainly confined to the dorsum of the forearm, wrist and hand, which seems to burn deeply as well as on the surface, if the grip is getting weaker, if he remarks all the time that it is a nuisance and very worrying, and that it interferes with everything he does, and that it is very sore, if gravity drags at it and he cannot lie on it and he wants his arm in a sling or uses his jacket as a sling, if he is weary and “fed up” with it, but yet, in spite of all this, if there is no positive limitation to movement or gross pain in the shoulder but merely a reluctance to move it, then I usually find that the area of most importance is the lower part of the spinal area mentioned above, namely, the upper dorsals and ribs, with particular emphasis on the first and second dorsal articulations. X-rays in these cases do not usually show much arthritic change except, possibly, of a spondylitic nature.

I have stressed these differential points because, in my opinion, the treatment of the two types of case which I have outlined should be quite different. In the first type, which is of a neuralgic nature, I concentrate on gradual mobilisation by treatment of all the surrounding soft tissues, muscles and articulations by stretching and traction with articulation. While doing this traction, in which I use a pull and push movement on the spinous processes, and when the conditions permit, I attempt corrective mobilisation of the particular articulation involved, and all the associated joints are put through their fullest possible range of movement. In the second type, which is clinically much more painful and disabling and is usually termed a neuritis, I have found that the quickest relief leading to subsequent cure is obtained by very specific and direct adjustment of the seventh cervical and/or the first and second dorsal articulations and the first and second ribs. This may sound contrary to what is generally accepted as the best method of dealing with this type of case, and is probably contrary to what the patient expects, but the patient will forgive you afterwards if you have really and definitely adjusted the lesions, though not otherwise. Firmness is essential in these cases, and the technical

correction should be accomplished swiftly, and traction or other treatment indicated being done afterwards.

I sincerely believe that in these cases, especially if they are in the sub-acute or chronic stage, you should "Find it, fix it, and leave it alone". However, in the really acute stage, if the pain is such that the patient just will not allow you to adjust the lesion, or if you feel that you cannot succeed in making the adjustment, even under anaesthesia, or, again, if you think that the origin of the neuritis is a focal infection or a general condition of toxicity, then by far the best thing to do is to rest the whole arm for some days by sling or tape to give time for the acute phase to settle down and measures of detoxification to take effect. Many other conditions and variations can and do arise from this cervico-dorsal involvement, and they all call for differential diagnosis, but I think the clinical states and symptoms outlined above will cover the majority of cases emanating from this area with which you will be called upon to deal in daily practice.

Under the second heading we are mainly concerned with actual limitation of movement in one or more directions of the shoulder joint itself which has been occasioned by some form of indirect trauma. For example, there may have been strain involving bursae, muscles, ligaments and tendons following on such things as improper use of the limb at an awkward angle, unexpected stress, occupational stress of a particular kind, or just bad posture, all of which may lead to disuse atrophy. Perhaps we should consider bad posture first and lay special emphasis on it, because there is much to be said about the relationship of bad posture to these shoulder complaints.

Let us review again the suspensory and extra-copial muscles. How easy it is for lesions of the cervico-dorsal region and the ribs to have a far reaching effect on the trapezius, the levatores scapulae and the two rhomboids as well as the large latissimus dorsi; one could almost describe these as the postural muscles of the trunk. The extraconal group which has a distinct bearing on posture consists, according to Cathie, of the muscles attaching to the crests of the tuberosities and to the floor of the groove of the humeral head. The pectoralis major is the large adductor and internal rotator forming the anterior axillary fold as it passes to its insertion on the lateral lip of the inter-tubercular groove. Just before the pectoralis major reaches its insertion, it passes over the long head of the biceps brachii, and it draws the arm downward and inward. The teres major passes from the axillary border of the scapula along the posterior wall of the axilla to its

insertion on the medial lip of the inter-tubercular groove in the crest of the lesser tuberosity. Its action is to depress the shoulder and draw the arm downward and inward, and this same action is attributed to the latissimus dorsi also.

It seems, therefore, that when a gross disturbance in body posture is added to gravitational forces and stress, the shoulder is liable to injury from what might at first sight appear to be a very slight degree of trauma. In the examination of shoulder disabilities of this kind one repeatedly meets with a history of apparently negligible trauma, such, for example, as weekend gardening. The moral is that, whatever symptoms are complained of in a particular case, we should not neglect lesions in areas remote from the joint itself which could be having an adverse effect on the general posture of the body.

The differences of opinion which are frequently expressed as to whether the long head of the biceps slips out of its groove in shoulder injuries can best be considered in the light of poor posture and the consequent contraction of these extra-conal muscles. It is certain that the constant pull of the arm downwards and inwards could occasion stress to this muscle tendon and, in certain circumstances, give rise to inflammation and distension of the tendon sheath at the point where it emerges from the capsular ligament of the shoulder. It is difficult, however, to see how this tendon, fitted in its groove and closely bound down by the strong transverse humeral ligament, could so easily slip out otherwise than by being torn out in gross dislocations. It would be much better to consider the real possibility that it is the humerus moving round a fixed tendon which predisposes to injury in this area, and that this predisposition is intensified if the posture is poor, especially if there is some focal infection or a condition of general toxicity. Diagnosis of this condition must be differentiated from sub-deltoid bursitis and supraspinatus tendonitis, although this is sometimes difficult. In fact, if any one of these three conditions is allowed to become chronic, it will tend to bring the others in its train. As St. Clair states: "Distension of tendon sheaths in the shoulder may be primary or secondary to bursitis in that area. An extended attack of bursitis will eventually involve the tendons of those muscles which are splinting, i.e. protecting, the joint against certain movements. Conversely, tenosynovitis in the area, if prolonged, will involve neighbouring bursae as the result of stasis".

In the really acute or toxic case of this kind it is best first to give rest by sling or tape in order to eliminate strain especially of the gravitational kind, to apply cold packs and, of course, to eliminate the focus of infection or toxicity. During this time exercises of the fingers, hand and forearm must be performed and the cold compresses or packs should follow the two to one formula.* Osteopathic manipulative treatment should commence as soon as all signs of acute inflammation have disappeared, but not before.

While it is difficult, as I have suggested, to outline a separate diagnosis for these three conditions, I think it worthwhile to make the attempt. In *tenosynovitis* or *tendonitis* of the *long head* of the *biceps*, there is usually a clinical history of insidious onset with intermittent pain which extends somewhat further down the arm than that associated with bursitis, sometimes along and medial to the biceps itself and involving the fascia down to the elbow. According to some authorities, a sharp burning pain is experienced, shooting down the middle of the deltoid to its insertion and involving the musculo-cutaneous nerve. Any marked rotation of the humerus exaggerates the pain and, as the biceps is a weak flexor of the shoulder, a flexor of the elbow and a very powerful supinator of the radio-ulnar joint, further pain is to be expected on forced extension of the forearm and more so still in resisted flexion and supination of the forearm.

The patient is disturbed when sleeping on the joint and finds difficulty in stretching the arm behind the back and reaching behind the far shoulder and the neck; pain over the extreme tip of the shoulder closely resembles the pain of sub-deltoid bursitis. Full, or nearly full, movement can be obtained passively in all directions, and resisted movements do not seem to register pain except possibly in forward flexion and adduction via the pectoralis major. *Supraspinatus tendonitis* generally follows repeated minor strain, the muscle being responsible for the first fifteen degrees of abduction. Pain is to be expected on the outer aspect and is said to follow the circumflex nerve and there is direct localised pain on pressure over the greater tuberosity of the humerus. Limitation of movement is noticeable only on abduction with a painful arc somewhere between 60 and 120 degrees; in fact a "catch" of pain as the torn fibres pass under the acromion in normal active abduction is typical. If the condition is neglected degenerative changes, with some calcification, may appear within the tendon fibres and this will cause the patient to be more aware of the painful arc in abduction. Calcification can be confirmed by X-ray. *Sub-deltoid* and

* Two minutes hot compress; One minute cold compress, Alternating

sub-acromial bursitis is usually caused by direct trauma on the shoulder from above. The bursae lie between the deltoid muscle above and the supraspinatus and the capsule below. In cases of acute inflammation full abduction is not possible because of the distension of the bursae and pain is registered by way of the axillary nerve when the deltoid muscle is called into action. In sub-acute and chronic cases the pain is intermittent and focal in distribution and a painful arc is present varying in degree and size, according to the degree of distension in the bursae and the amount of abduction. Some authorities claim that there is no pain on resisted movements and that extreme elevation is not possible, but I believe that much depends on what stage the patient has reached when he comes in for treatment.

The management of all these conditions should be governed by certain definite considerations. First, it must be remembered that adequate drainage is a positive necessity, and this should be obtained, after the removal of any foci of infection, by rest and the application of cold packs to reduce inflammation, distension in synovial cavities and congestion in the tissues. Secondly, as soon as this is accomplished, osteopathic treatment should commence with the object of increasing the range of movement, this being done by passive and active movements and the stretching of affected ligaments and muscles as far as pain will allow. Techniques to effect specifically the bursae and tendon sheaths should be used and active-resisted exercises should be devised for the different muscles and tendons which are affected. Naturally, if what I have recently seen described as “discopathy of foraminal encroachment” (slipped disc to you) is present, manual or sustained traction to head and neck should be included in the treatment.

Strains of the acromio-clavicular joint are, as you all know, associated with pain in the shoulder. The common osteopathic lesion is a movement of the clavicle upwards and backwards over the acromium, but if the injury to the joint is such as to include tearing of the conoid, trapezoid and other ligaments of the articulation, then the gravitational pull of the arm brings the scapula down and the acromion process lies much lower below the clavicle and we have a much more serious condition amounting to what is often a dislocation rather than a subluxation. The distinction between these two types of condition must be emphasised because of the contrast in the treatment which is indicated. Any normal severe strain of the joint requires osteopathic treatment and exercises together with correction and

balancing of all adjacent structures; any confirmed subluxation requires specific adjustment followed by immobilisation by shoulder to elbow strapping for the requisite period; dislocation may need anything from specific reduction to extensive surgery followed by partial or full immobilisation in cast or splint.

However, in the sprain or strain which we usually meet, the symptoms, in addition to the specific pain in the shoulder, are, difficulty in raising the arm so as to touch the back of the head, extreme discomfort on moving the arm backwards as in putting on a coat, general reluctance to move the arm and shoulder and some pain along the long head of the biceps into the arm, over the deltoid or along the axillary nerve. Clark says that these symptoms can be readily understood when it is remembered that the anterior thoracic, sub-scapula and axillary nerves supply this joint and the skin over it as well as the deltoid muscle and its associated skin area.

You will have noticed, no doubt, the constant recurrence of certain particular symptoms in these conditions which we have been considering. A very constant symptom is the inability or unwillingness to move the arm in certain directions, notably in abduction and external rotation. Pain, or the desire to avoid pain, is mainly responsible for this inability or unwillingness, and these in turn lead to further immobility of the shoulder joint so that eventually there is a protective spasm of the muscles and we are faced with conditions described as peri-arthritis, or obliterative bursitis of the shoulder, following the more diffuse form of traumatic degeneration and inflammation of the capsule and peri-articular tissues. This comes very near to the condition commonly known as "Frozen Shoulder", although it is not quite the same and should be differentiated from it. We must make a clear differentiation between peri-arthritis, true arthritis and "Frozen Shoulder", which last condition always implies that there are adhesions specifically throughout the peri-capsular tissues.

In all these stages or conditions there is the muscle spasm of protection, but in peri-arthritis the movements which are guarded against the most are those of abduction and external rotation, while there is reasonable movement in other directions with comparative freedom of the glenoid-humeral joint itself. On the other hand, in true arthritis, the glenoid-humeral joint is relatively fixed and pain is constant from any angle of suggested movement and from the very commencement of that movement. It follows that when muscle spasm or splinting is allowed to continue, limitation of movement increases and adhesions commence to form with

muscle wasting. When these adhesions progress sufficiently seriously to interfere with the gliding mechanism of the joint, and when pain, which increases progressively, is encountered after movement of, say, thirty degrees has been initiated in most directions, then we can assume that we have to deal with a case of the type known as “Frozen Shoulder”.

Before discussing the treatment of cases which can be classified as “Frozen Shoulder”, I would like to comment on a few relevant points. First there is the problem of manipulation under anaesthetic. There are still differences of opinion as to whether anaesthesia is really necessary, which type of case is suited to it and what deciding factors should determine its use. In my opinion, based on experience, anaesthetic manipulation is the procedure of choice when all further progress towards full restoration of movement is positively barred by excessive pain and/or severe muscle spasm as the result of generalised adhesion formation.

It has been said that true arthritis should never be manipulated under anaesthetic and that it should be allowed to await what is known as spontaneous reduction or recovery, a process which may involve waiting for from six months to two years. The argument is that forced manipulation can only have a harmful effect. While I must concede that harm can result, especially if the case is really acute, I suggest that much depends on the interpretation of the words “forced manipulation” and on the stage at which the patient presents himself for treatment. I can illustrate this point if I may be allowed to make a digression.

Each generation of osteopaths will be likely to come up against one or more surgeons, usually orthopaedic specialists, who show fanatical opposition to osteopathy and osteopaths. This opposition exists today though it is not so fierce as it was thirty or more years ago. In my early days of practice, there was one particular gentleman who breathed forth fire at the very mention of osteopathy and who was alleged to have remarked at a local medical meeting that “Osteopathy consisted of nothing so much as brute force”. Some little time afterwards he published a book on *Manipulative Surgery* in which he stated that “Osteopathy is a typical American money-making stunt” or “an American commercial enterprise”, and yet he began his chapter on manipulation of the shoulder with the following observations: “One of the most awkward situations in surgery arises when it has to be explained to a patient that his arm was broken while he was under the anaesthetic. If it is not explained to him he will soon find out. Fracture of the humerus is the only real danger to be

anticipated in manipulation of the shoulder. *It is an accident which has happened many times and it should be avoided at all costs.*"

If this is not "brute force" it is hard to say what is. This book was published at about the time when I did my first shoulder manipulation under anaesthetic in 1932, and, I must admit, I was scared for quite a while, but after each succeeding case I realized that the stage which the condition had reached when the mobilisation was attempted was what should govern not only the amount of force to be used, but also the exact type of technique. If these matters are given very careful consideration then an accident of this kind should not happen and even true arthritis can be considerably benefited by manipulation under anaesthetic. Secondly, it must be emphasised that active exercises are an essential part of the treatment of these conditions. These may have to be graded according to the case from assisted active to resisted active exercises and may include wall crawling, towel swinging and weighted gravity angle swings, but they must be insisted upon and carried out persistently by the patient, preferably for a few minutes every hour rather than twice a day. If the patient will not co-operate it is far better not to undertake the case.

TECHNIQUE OF MANIPULATION

In the technique of manipulation of the shoulder joint there are certain rules to be observed if you wish to avoid further injury. The first point is that short leverage is essential and long leverage should never be used except by an expert. The important safeguard is never to impose a joint between the objective of your treatment and the lever, which should, therefore, in this case be the elbow. Whenever you apply leverage from the elbow you should apply equal counter pressure to the head of the humerus. Axial traction should be used whenever possible, and it is an axiom that the closer you can confine your manipulations to the head and neck of the humerus, the less is the risk of accidents. The humeral head is nearly always held superiorly to the glenoid cavity mainly because of adhesion formation in the bursae and the peri-articular tissues, and so must be brought down in order to resume its normal relationship with the glenoid. There are, however, exceptions to this in cases where there has been extensive tearing of the ligaments of the acromio-clavicular region, when the humeral head is inclined to hang low.

I would now like briefly to recapitulate to some extent and to discuss the treatment of the three main types of condition. The average "over all" stiff

shoulder which we meet with in office practice is the condition known as peri-arthritis which involves both muscle tendons and bursae in varying degrees of degeneration and exhibits limitation of movement mainly confined to abduction and external rotation. This condition will give way to osteopathic treatment especially if this is applied to spinal lesions affecting the suspensory muscles, the extra-copial group and the rotator cuff muscles, in that order, and using your techniques of choice for gapping the joint itself and when necessary for relaxing individual muscles. Anaesthesia is not really necessary unless there is reason for excessive haste, but it is absolutely essential to instruct the patient in exercising the part and to insist that he carries out the instructions. In true arthritis of the shoulder, if it is acute and fixed, you will meet with great resistance to movement in any direction from the very commencement of the movement. This resistance is because of pain and it means that the pain factor is ahead of the muscle spasm and this in turn means that any manipulation given, with or without anaesthetic, in an attempt to normalise the joint must be applied little and often. Contrasting hot and cold packs can be applied with benefit and at times ultra short-wave therapy can be helpful, especially between treatments. In these cases too, exercises must be carried out from the assisted active to the active and, if tolerated, to the resisted active. The "Frozen Shoulder" with its peri-articular and peri-capsular adhesions is a definite entity and must be treated as such.

In my opinion, manipulation under anaesthetic is necessary in these cases, but it should never be attempted while active inflammation is present and then only after progress has ceased despite all exercise by the patient and ordinary osteopathic treatment. If pain is great, muscle spasm deep and movement apparently arrested in most directions, then manipulation under anaesthetic is the treatment of choice. Personally I prefer pentothal as an anaesthetic simply because, by virtue of the slow recovery to consciousness, it allows of the application of a succession of cold packs which have been shown by experience to limit the post-operative pain to the absolute minimum, and so to deprive the patient of any excuse for omitting his exercises. The manipulation should be very carefully considered and should be limited in its scope, the techniques being selected for the particular case and applied specifically. It is far better to under-treat than to attempt too much in one manipulation. Unless absolutely necessary, muscle stretching as usually understood is positively to be avoided during anaesthesia, and also passive stretching afterwards. The aim of manipulation under anaesthesia is to break down adhesions to enable

further movements to take place and if too much is attempted at one time the patient will probably be worse off than before. My own preference is to manipulate twice with an interval of two to three weeks between, and daily visits during the interval; I never aim at achieving full movement the first time. Adhesions can be heard and felt to give way and manipulation should stop short of exhausting them. If the adhesions feel and sound sharp as they give way, the after-treatment is straightforward; but if the sound and feel can be compared to the tearing of damp paper, then you should take steps to cope with a certain degree of residual inflammation latent in the joint, and your prognosis of the time for recovery must be lengthened. However, in normal circumstances, we can claim to have reduced the overall time for recovery in these cases to six weeks provided that two anaesthetics are allowed.

SHOULDER TECHNIQUE

EXAMINATION

Apart from the obvious regular tests in examination of these shoulder conditions, there are one or two points which should be applied automatically as a routine initial test. These are concerned with purely glenoid-humeral mobility and are known as shoulder roll, anterior-posterior movement of the humeral head on the glenoid and glenoid humeral springing.

In the shoulder roll (Fig. 1), the middle finger of each hand is placed between the coracoid process and the humeral head. Alternate trunk rotation is applied—if to the left, separation will be felt at the right articulation and vice versa. Any condition involving the internal rotator group of muscles will skew up by limitation in separation and movement.

Anterior-posterior movement is elicited by fixing the scapula via the coracoid process and the spine of scapular with the one hand and moving the humeral head directly backwards and forward with the other hand—movement in this test is very much limited in cases such as peri-articular adhesions, etc., and almost completely immobilised in true arthritis and frozen shoulder conditions.

Glenoid humeral springing (Fig. 2) gives the same results as above but with further painful reaction. Active and passive tests for the degree of movements in abduction-adduction and internal and external rotation should follow and allow you to arrive at a fairly accurate diagnosis.

TECHNIQUE OF TREATMENT (GENERAL)

It is axiomatic that if complete circumduction of the shoulder can be accomplished with fixation of the scapula then all pain and other symptoms complained of are of a referred nature and outside the shoulder joint as such. I accept this as my own approach in treatment and proceed from there.

Irrespective of any particular cause, I commence treatment of these conditions by eliminating where possible the obvious spinal articular lesions in the upper cervical-cervico-dorsal, dorsal, lumbo-sacral and pelvis. This will take care of most conditions in the first group, i.e., referred or reflex cases.

From here, that is in shoulder conditions *per se*, any approach in treatment is, of course, individual. I usually commence my direct treatment by applying some gapping strain to the joint proper. This can be accomplished as in Fig. 5, where the gapping strain can be increased by elevation of the operator's heel in opposition to downward traction applied above the elbow. This is followed by taking the arm into maximum abduction under traction and applying a short sharp thrust over the lateral head of the humerus in a downward medial direction with the heel of the opposite hand (Fig. 6). Fixation of the scapula and splinting against injury is supplied by the operator's knee. Another method is shown in Figs. 24, 25 and 26, with traction gapping being applied over the operator's thigh while he attempts mobilisation of the joint with the proximal hand.

Short leverage mobilisation in internal and external rotation is shown in Figs. 15 and 16, with the weight in palm of hand to maintain external rotation.

Fig. 7 illustrates a method of traction abduction through the grip of the operator's legs around the elbow while the two hands, placed as high as possible, attempt to mobilise the glenoid humeral articulation in every direction and thus stretching and freeing adhesions in the capsule and peri-articular tissues. This manoeuvre can be preceded or followed by the manipulation shown in Fig. 8, which achieves the freeing of the joint by flexion and extension of the arm under traction from the elbow. These actual specific manipulations can be rounded out by the techniques shown in Figs. 3 and 4, which tend to release the humeral head and bring it more in line with the glenoid cavity and with resultant increase in abduction. Fig. 4 is the position adopted for work under anaesthesia. Figs. 9 and 10 illustrate two useful exercises: gravity swinging from the shoulder

supporting about a thirty-pound weight. “Wall crawling”: note the cushion which must be supported by the patient’s body throughout the exercise.

TECHNIQUE UNDER ANAESTHESIA

Before dealing with this subject I would suggest we refer to that part of this lecture which is headed “Technique of Manipulation”. There are rules to be observed in any manipulation, but they are of special importance in shoulder techniques and especially so in manipulation of this joint under anaesthesia—let me repeat:

1. No muscle stretching as usually understood by this.
2. Short leverage.
3. Traction.
4. In a “Frozen Shoulder”, stop your first manipulation when you have gained half the amount of freedom of movement required for the full range of complete circumduction.

This latter point is perhaps the most important if you wish to avoid such post-operative pain as would make the patient reluctant to do his exercises or for that matter, be reluctant to return fearing further pain and thereby leave you with your work only half completed. If the full procedure is explained to the patient beforehand, of two anaesthetic manipulations being required with a two or three week interval between them, there is usually little difficulty in following the case through to its conclusion.

Selected techniques should be decided upon according to the individual case before commencing your manipulation. These must be adhered to rigidly and any attempt to add further techniques must be resisted, except, of course, in exceptional circumstances.

The manipulations now to be demonstrated are those I use myself under anaesthesia, although not all techniques are shown here.

Commence by increasing the degree of flexion and extension as shown in Figs. 11, 12 and 13—note that no attempt is made to force full movement here—with the patient still supine follow with the technique shown in Fig. 14, which will stretch adhesions in the posterior lateral areas.

N.B. – Traction caudalwards is essential here on the elbow.

The patient is now turned on to his side with lesion side uppermost. The techniques illustrated in Figs. 17, 18, 19, 20 and 21, also 22 and 23, are extremely good under anaesthesia but must be specifically controlled by

the operator because they constitute a very powerful leverage and must be used with the utmost discretion. Any accident could happen at this stage and the amount of post-operative pain is controllable at this point. These particular techniques are ascribed to C. H. Spencer of Los Angeles, who demonstrated them as far as I know, about twenty-five years ago. Floyd P. St. Clair also stresses these movements in his book on *Manipulative Treatment of Athletic Injuries to Joints*, published in 1941, and which is dedicated to Dr. C. H. Spencer. I can only add they make all the difference in shoulder technique between the “pull about stretch at random technique” and “specific scientific control”, so definitely needed in these cases.

These techniques (Figs. 17 to 21) show the traction-rotation stress applied to all muscles and tendons concerned in forward rotation—to the anterior ligaments of the shoulder and to the anterior aspect of the capsule. Fig. 22, graded in degree according to the amount of fixation is a technique *par excellence* in effecting the reverse of the above, i.e., it exerts traction-rotation on all muscles and tendons concerned in backward rotation and on the posterior ligaments and capsule of the shoulder. The technique already illustrated in Fig. 4 is usually the one with which I finish the manipulative series under anaesthesia, although it is understood that most techniques demonstrated here today, other than those shown in the sitting position, can be usefully applied as well.

THE KNEE JOINT

T. EDWARD HALL

Cunningham states "The knee joint has a remarkable combination of freedom of movement and stability. In most of the other synovial joints, when one of these qualities is definite the other is rather deficient. Stability at the knee is attained not by the exact fitting of opposing articular surfaces or by the strength of capsular ligaments. The important factor is the number of strong muscle tendons which traverse the joint. Here to a large extent, the muscles are the ligaments."

Northup says "The knee joint comprises one of the most intricate areas of man's musculoskeletal system, and its mechanics and structural lesions constitute one of the greatest problems."

I say it is an ugly joint, nevertheless it pays good dividends if studied closely.

This leads me to remark that I think papers such as this on the knee joint should be preceded by other papers on the applied anatomy—the mechanics and the osteopathic management of these conditions. A symposium in fact.

Today I would like to discuss partly the mechanics of the joint and partly the diagnosis and osteopathic management of some of the more common conditions encountered in normal office practice.

Let me commence by telling you I don't think I have anything new to contribute by way of diagnosis or osteopathic technique in the correction of knee joint conditions, but that, I am sure, doesn't make the knee joint less interesting. On the other hand, when it comes to injuries of the knee, there appears to be little we can learn from our medical friends. On the whole, they seem to be rather vague about knee injuries altogether. Even in the reduction of the classical displaced meniscus, there would appear to be differences of opinion between them as to the specific methods of reduction to employ. There should be no such differences of opinion between us when there is a cartilage to be reduced. We must admit that displacement of cartilages do occur and where it is a confirmed fact, immediate reduction is called for, but if it has previously displaced two or three times, and you have ruled out loose body pinched membrane malalignment, etc., then splitting or tearing of the cartilage cannot, in most cases, be far behind and when this occurs, bearing in mind the patient's occupation, it usually becomes a case for the surgeon.

The point that must be stressed from our point of view is, are all cases of knee derangement cases of displaced cartilages?

We, you and I, know that while we are called upon to deal with many hundreds of cases of knee disablement, discomfort and pain, only a very small percentage of them can be classified as a definite displaced meniscus. Except where certain occupational hazards exist, i.e., footballers, ballet dancers, miners, etc., if all present here averaged one true cartilage a year for each year in practice, it would be something extraordinary. When we do come upon this condition, especially on the first occasion, we can and should be able to specifically correct it and then follow up by adjustment of the lesser mechanics of movement to the greater. If this is accomplished correctly, all things being equal, the knee should be able to function normally in every way. It is the neglect to normalize the lesser movements of sidebending and rotation, and neglect in the insistence on the carrying out of the appropriate exercises which leaves the knee open to permanent injury.

In the athletic sections of the American Journals of Osteopathy during 1931-32 and 1933, there was published a series of articles on athletic injuries—and very fine articles they were and for my money, they still are. They were later republished in a manual with the title “Osteopathic Care of Athletes,” and perhaps may still be obtainable from the A.O.A. offices in Chicago. One of these articles, in fact, I may say two of them are, in my opinion, classics of brevity and knowledge. They were written by Dr. James A. Stinson of the Chicago College, and contain most of what you need to know about the diagnosis and the technique of adjustment in “Genicular Conditions.” I trust you will bear with me while I quote one or two points from these articles.

Discussing the functional anatomy of the knee, he states: “In the anatomy laboratory extreme care was taken to examine the cartilages of all the cadavers. The knees of a total of eighty-five cadavers (340 menisci) are a matter of record. Fifty-six special knee dissections were made.

From these investigations it was found that less than one per cent of the specimens presented evidence of tearing of the cartilage or its attachments. This directed attention to the functional anatomy of the joint.

Several considerations need emphasis. First, the attachments of the menisci. These crescentic plates of fibro-cartilage have direct attachment by means of dense fibrous tissue from the anterior and posterior horns of the cartilage to the front and back parts of the non-articular area of the upper

surface of the tibia. In addition, there is an attachment to the capsule of the joint, the coronary fibres, serving to hold the periphery of the cartilages to the head of the tibia. The transverse ligament is a dense fibrous layer from the anterior end of the medial meniscus to the head of the tibia, and another slip connects the two anterior ends of the two menisci. Posteriorly, the ligament of Wrisberg is an accessory band of fibres from the posterior attachment of the lateral meniscus to the posterior cruciate ligament. Many times there are two slips, one in front and one behind, the posterior cruciate.

Second, the shape of the menisci: the upper surface is concave, the inner margin being comparatively thin, the thick convex border fixed in relation to the periphery of the joint. This surface is designed to fit the femoral condyle. The under surface is flattened out to fit the comparatively flat surface of the tibial head.

Third, and this is most important, the function of the menisci: in all movements of the knee, the *cartilages move with the tibia*. But they have *some gliding motion on the tibial head*, and it is this which accommodates changing femoral condyle contour to the flat surface of the tibial head. The shape and position of the cartilages on the tibia are determined by the femur, within the range permitted by the absolute fixing attachment of the cartilages to the tibial head. This accommodation range is true not only in flexion and extension, but especially for side-bending and rotation.

Hence: 'movement of the menisci is therefore directed by the femur and limited by attachment to the tibia.'

Exaggerations of the normal movement of any joint may serve to produce subluxation. This is true of the knee, and a frequent and easily demonstrable lesion is a subluxation of the femur on the tibia. When this occurs, the meniscus is in trouble, just as the articular cartilage of any joint is disturbed in subluxation.

N.B. The malposition of the femur on the tibia decreases the range of cartilaginous movement by requiring approximately maximum movement of the cartilages on the head of the tibia, thus decreasing the accommodative mechanism by exactly that much.

In mal-relationship of the femur and tibia, apparently the lesser movements of the knee are most frequently involved. These movements, such as sidebending and rotation may be overlooked in considering the

knee as a whole, because of the more obvious interference with the larger movements. such as flexion and extension.”

Fryette means just this when he says “there are two main types of motion in the knee joint. Above the meniscus the motion is flexion and below the cartilage the motion is torsion.”

These ideas were formulated following years of clinical treatment, X-rays and dissection of over 800 cases at the Chicago College and are probably the most important from our osteopathic outlook, and when I am called upon to deal with, or examine, a knee joint it is this viewpoint in the main I have in mind, and it has yet to let me down. What it amounts to in 90% of knees coming in for treatment is to assess the limitation of movement in the lesser directions—that is, to test for resistance to sidebending and rotation and when you have found that resistance, overcome it. It’s as simple as that. Flexion and extension naturally must follow.

There is something spectacular in the reduction of a displaced semi lunar-cartilage, one has a feeling of accomplishment and satisfaction and the patient afterwards is agreeably happy, yet the adjustment of these non-spectacular conditions is just as satisfying, with equal results, to yourself and the patient.

It is generally accepted that in the majority of these malalignments it is the femur that moves medially on the fixed tibia, giving rise to an apparent clinical lateral shift of the tibia with or without subsequent rotation inward or outward of the lower leg and foot. Mention should be made of the many types of bursitis which accompany this lesion, and of the diffusion or absorption which takes place after reduction of the subluxation. Many so-called “charleyhorses,” muscular pain and dysfunction of the thigh and calf, may be traced to this lesion.

I am making no attempt to discuss fully the trophic influence of lumbar vertebral lesions, particularly those about the second and third lumbar segments, the effects of tensions on the knee from hamstring or quadriceps pull from sacro-iliac lesions; capsular stretch from subluxations of the proximal tibio-fibular joint; ruptures of the cruciate, the internal or the external lateral ligaments; or fractures, since most of these conditions are easily differentiated.

Fractures into the joint, those of the femoral condyles, head of the tibia, tibial spines, fractures of the patella, fracture-separations of the tibial

tuberosity (Schlatter's disease), and fractures of the fibula (head), are of not infrequent occurrence. Torn patella tendon and extensive periostitis may cause as much dysfunction as some fractures.

In individuals, older and younger than the average football player, loose bodies, including hypertrophied synovial fringes, intra-articular exostoses of spurs, extra-articular exostoses interfering with tendon action, osteo-arthritis and other forms of chronic arthritis, both tuberculous and non-tuberculous, chronic abscess, myeloma, myositis ossificans, affections of the epiphysis of the periarticular ganglia, recurrent dislocation or un-united fracture of the patella, hypertrophy of the infrapatellar pad of fat, foreign bodies, etc., etc., will be among the findings. Some of these conditions are rather rare, but it is interesting to note that most arthritic cases present the picture of genicular subluxation.

We should remind ourselves also that in children under 12 years of age complaining of pain in the knee, especially if apparently disabled by the condition, we should of course, rule out any possibility among hosts of others already mentioned, conditions such as Osgood Schlatter's disease, Pelligrini fractures and congenital discoid meniscus, etc. (The displaced cartilage as such is a very rare thing in this group).

EXAMINATION

As for the examination of the knee, you all of course, have your own approach but will agree, I'm sure, that the history of the onset of symptoms is most important. Synovitis and Bursitis, Haematomas, Haemo-arthritis, etc, are obvious only because they are swellings, and we must of course, aim to differentiate between the vascular and lymphatic types in view of the subsequent treatment. These differences I can only stress in brief, for instance, the acute *vascular types*, as you know, exhibit heat, redness, signs of haemorrhage, pain illicit locally, rapidly acquired swellings and irregularity in *size* and *shape* and *site*. The *lymphatic types* are more or less the reverse, no heat, very little actual pain, more of a discomfort experienced at the extremes of flexion or extension with swelling slowly acquired and regular in outline and with joint hyper-mobility. I don't think we need to go into the general osteopathic treatment of these particular conditions now, except to warn against the fallacy of prolonged heat as an adjunct-contrast packs, or cold by way of compresses, or ice packs will always get you better and quicker results.

Northup says in examination of the functional parts of the knee joint, particular emphasis should be placed on the following:

1. *Quadriceps femoris muscle group*. Represents stability-most important muscle group. Can waste 1" in 24 hrs. Must be exercised from the beginning of any injury.

2. *Hamstrings*. Check for sacro-iliac lesions. Contractures in body of muscle. Knee flexion. Pain posterior knee-look for lumbar lesions.

3. *Tibial and fibular collateral ligaments*. Tears mainly-seldom torn through. Differentiate from cartilage. More medial-abduction and adduction tests. Complete tear = surgery.

4. *Cruciate ligament tears*. Often strained-seldom torn. Hypermobility joint.

5. *Lateral and medial menisci*. Rule out cartilage & cyst. Look for malalignment/locking.

6. *Infrapatellar fat pad*. From old injury-adhesion formation repeated Synovitis-limit full flexion and sometimes extension.

7. *Bursae of the knee*. Mostly involved in knee injury-single or multiple.

8. *Patella and patellar ligament*. Must be freed before flexion or extension. Superior inferior movement most important. Lateral mobility-arthritis-under surface grates.

9. *Femoro-tibial articulation*. Malalignment-most frequent single lesion of knee joint.

10. *Proximal tibio-fibular articulation*. Usually in lesion posterior superior-include distal articulation. Prevents full plantar flexion.

For myself, in addition I am always interested in what we might call the three L's, i.e. limping, locking, limitation to movement. These have mainly a mechanical background rather than a physiological one. They are separately or together, present in such conditions as displaced cartilages, loose bodies, pinched membrane, pre-patellar adhesions and any of the irregularities in alignment of the femoral tibias articulation. Diagnosis is obvious in some of these conditions and not so obvious in others, but again the history is the pointer.

A few examples may be quoted that embody these points.

CONDITION	LOCKING	LIMPING	LIMITATION TO MOVEMENT
Displaced Meniscus acute	Positive pain mid-way	Tip toe – pain right angle flexion	Maximum all directions
Repetitive-Chronic	At extremes of extension - flexion	Flat foot or half point knee flexion	Positive minimum in all directions
Loose or Foreign Body	Slight flexion and extension alternating with lock	Flat foot, slight flexion	Extreme, outside contact point
Malalignment Tibia on Femur	Nil. Except full extension	Hardly noticeable	Extremes of extension and flexion
Pre-Patellar adhesion	Nil but lack of freedom of movement	Not noticeable	At extremes of flexion and extension with slight localised pain behind patella
Pinched Synovial Membrane	Nil except on extremes of normal	Hardly noticeable except from habit	Extremes of flexion and extension. Sense of insecurity
Coronary ligament	Nil – differentiate between external Cartilage and Cyst	Slight in mild flexion	Full extension
Posterior Capsular adhesion or Cyst	Nil	Slight in flexion, unable to stride normally forward	Definite to full extension contracted biceps

SWELLING	PAIN	REDUCTION
Slow, after 12 hours	Great over coronary ligament	Reduction difficult
Positive if not reduced	Over coronary ligament	Reduction easier
Often rapid	Localised within joint	Lucky – in the very young unlocks itself
No swelling	Minimum, but feels not free in movement and uncomfortable	Direct resisted lateral thrust
Usually nil, except behind patellar tendon	On forced flexion	Forced flexion and circumduction
Slight	Over medial and coronary ligaments	Forced flexion
Slow in onset	On torsion, rotation and extension	Friction direct over ligament on tibial head
Slight and warm	Sharp behind knee on full extension	Forced extension, stretching

These observations should prove to us that diagnosis is the result of elimination by examination, and where the conclusion in the diagnosis points to specific faults, mechanical or otherwise, then the technique of osteopathic adjustment should be made equally specific to overcome them. Therefore, it follows that any technique that restores the freedom of movement of the cartilages on the tibial head, thereby bringing about the balance of movement between the condyles of the femur, the accommodating mechanism of the cartilages and the tibial head will be good osteopathy and good technique.

At the risk of boring you further may I repeat that, as in any lesion or in any articulation, it is the amount of trouble you take in the diagnosis that enables you to apply the right technique, or, as Fryette used to say, "It's the hours of study that makes the minutes in treatment." I have demonstrated the techniques I have in mind to show you many times over a number of years, and I can only hope that this revision will prove useful and worthwhile.

However, in encouragement to those who feel that specific knee technique is difficult, I would like to close this paper with a quote from A. T. Still's *Osteopathy-Research and Practice*. He states in regard to the technique of reduction generally: "I want to make it plain that there are many ways of adjusting bones. And when one operator does not use the same method as another, it does not show criminal ignorance on the part of either, but simply getting results in a different manner. A skilled mechanic has many methods by which he can produce the desired result. A fixed point, a lever, a twist, or a screw power, can be and are, used by all operators. The choice of methods is a matter to be decided by each operator and depends on his own skill and judgement. One operator is right-handed, the other left. They will choose different methods to accomplish the same thing. Every operator should use his own judgment and choose his own method of adjusting all bones of the body. It is not a matter of imitation and doing just as some successful operator does, but the bringing of the bone from the abnormal to the normal."

Find it – fix it if possible – re-check – leave it alone – re-check.

CORRESPONDENCE

The President
The Osteopathic Institute of Applied Technique
30 Tonbridge Road
Maidstone, Kent

Dear Mr. President

This number of the Year Book (1956) is intended to be in a special way a memorial to the late Dr. J. M. Littlejohn and a considerable part of it is devoted to a publication of material left by him. I would like to take this opportunity to make the strongest appeal of which I am capable for the preservation, proper editing and publication of the Littlejohn material. I cannot claim to be as well-read in osteopathic literature as some others but I am, nevertheless, convinced that we have in what has been left by Dr. Littlejohn something which is altogether outstanding and unique. It would be a disaster if it should be allowed to die, and I would even go so far as to say that if it is allowed to die, osteopathy in the sense of a real system of therapy with an application to all kinds of circumstances and conditions is likely to die with it.

Dr. Littlejohn had a knowledge of anatomy, physiology and body mechanics which was something altogether out of the ordinary and he used this knowledge to make a detailed study of every physiological and pathological process taking place in the body. On the basis of this he has worked out a purely osteopathic approach to every sort of abnormality, disease or symptom which can arise in the human body.

In the realm of technique, too, his approach is extremely stimulating and represents a tradition which is possibly in some danger of dying out. There is nothing very "slick" or spectacular about it, but it is at the same time more specific and less specific than the type of technique which often obtains today. It is less specific in the sense that for a particular condition he will often treat over a wider area than is now usual, but this is because he has given profound thought to all the nerve pathways as well as to the mechanical problems involved in the condition; it is more specific because he leaves out nothing which may have a bearing on the particular condition and his soft tissue work as well as his corrective work is highly purposeful and based on a profound knowledge of how muscles, fasciae and ligaments are arranged and function.

It has possibly been felt by some that the Littlejohn material should not be published until it has all been checked over and revised by modern research anatomists and physiologists, and this may account for the fact that it has tended to be stored away in cupboards and not much used since Dr. Littlejohn's death.

I personally am not able to share this view. I do not believe that the material, as far as I have seen it and studied it, dates very much and I feel it to be a foundation for the further progress of genuine osteopathy which we shall neglect at our peril. The fundamental knowledge and the facts on which it is founded have not greatly altered and are not likely to do so. It is possible, no doubt, that in some particulars it is incomplete or out-of-date in the light of more modern discoveries or research, but it is essentially sound and, in any case, its publication is a necessary preliminary to detailed study, appraisal or modification of it.

The real difficulty lies in another direction. The material is nearly all in the form of lecture notes of which there is often more than one version, it is not always clear or easy to understand, the nomenclature and phrasing is sometimes old fashioned, and it is not in literary form. The task of putting it into a form which is readable, understandable, and suitable for publication in a book or journal is a big and difficult one, requiring some knowledge of editing and a willingness to study and check up many points and passages which seem at first to be obscure. From the little I have tried to do in this way I can testify that it is arduous work, but it is also very rewarding, for it opens up new vistas of the possibilities of osteopathy and brings one into direct contact with a very scholarly and distinguished mind. I can also say from experience that the work has a great practical value for anyone who undertakes it, for more than once I have, in doing it, found quite by chance just what I needed to deal successfully with some difficult case on which I was engaged at the time.

However, time is passing and those who knew Dr. Littlejohn personally and who sat at his feet are dying or getting old; there is an enormous amount of material to be dealt with, and it seems to me that what is required is a number of workers who will undertake, both as individuals and as a team, to go through the material, section by section, with a view to preparing it for publication and putting it into a form in which it can be used more widely in teaching and research. Is it too much to hope that, without too much delay, enough people will be found to push this work forward, work which seems to me at least to be quite as important and no more difficult than seeking to reconcile osteopathy with current medical thought and theories on which considerable energy is from time to time expended by members of our profession?

Yours truly

JOCELYN PROBY

The President
The Osteopathic Institute of Applied Technique
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Dear Mr. President

It is now ten years (1957) since the death of Dr. J. Martin Littlejohn, and, in remembrance of his kindness and patient teaching, I would like to take this opportunity of reminding all practising osteopaths of what he did for them and for Osteopathy in Britain.

Dr. Littlejohn was one of the first students who studied under Dr. Andrew Taylor Still, the founder of Osteopathy. When he left this country as a young man he was regarded as being under the sentence of death as he had been told by Sir Morell Mackenzie that he had a tubercular throat and had not long to live. During his travels he met Dr. Still, a retired Army Surgeon, who, having himself lost several members of his family, who had proved to be beyond the help of ordinary medical science, had come to feel that there must be some other means of healing capable of saving lives in such circumstances and had as a result, evolved the science of Osteopathy. Dr. Still examined and treated Dr. Littlejohn, who subsequently lived to be seventy-nine years of age.

Dr. Littlejohn became both a student and a lecturer at the Kirksville College of Osteopathy, and shortly afterwards founded the Littlejohn College which is now known as the Chicago College of Osteopathy. Later he returned to Britain and started in a very small way to develop osteopathic education in this country. He had to fight every inch of the way and to carry on his own shoulders the educational and financial burden, for he received very little assistance from the osteopathic profession as a whole, though one or two members of it gave their names in support of the School which he founded. Only after the first hard years did a few come forward to help in teaching; some of these were not trained teachers, but they gave of their best. Gradually a very flourishing school and clinic were established, and Dr. Littlejohn pursued his course in spite of much criticism.

There was no-one who could challenge his knowledge of, nor ability in, osteopathic diagnosis, technique and treatment. His technique was not like that of those he chose to call "the pull and push merchants", but was based on a thorough knowledge of the anatomy and physiology of the body and the natural use of his hands, which he considered of more value than the use of any mechanical contrivance. I, myself, worked with him for several years, helping him in his private practice and seeing many of the wonderful things he did.

Five years of nursing experience in various hospitals in wartime has further helped me to realise how much we owe to him.

I am sure that if Dr. Littlejohn were alive today he would deprecate the fact that many osteopaths are not carrying out the true theory of Osteopathy as practised by Dr. Still and later by himself.

We cherish the memory of all the wisdom, kindness and patience shown to us all in our days of training. No-one understood better than he the intolerance of the student mind and the students' belief that they know better than their teachers.

After ten years he is still sadly missed in British Osteopathy and undoubtedly there is no-one to take his place.

Yours truly

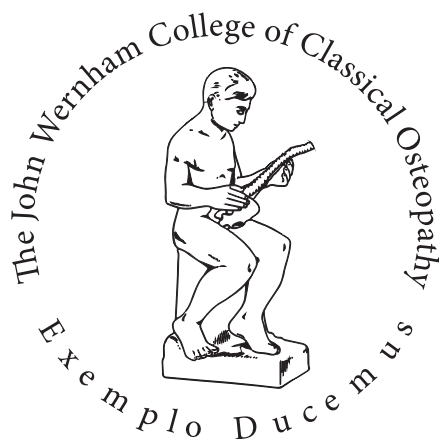
ELSIE W. WAREING DO MRO



The Osteopathic Institute of Applied Technique began with a series of lectures given during the year of 1954 at quarterly intervals and at the invitation of the Management Committee of the Maidstone Osteopathic Clinic. Its purpose was the preservation of the Principles, Technique and Practice of Osteopathy as laid down by Still and Littlejohn.

The lectures were given by the Founder Members and invited guests. These were then collected and published in a Year Book dating from 1956. Long since out of print it was considered that such valuable material should be made available to a generation of students and practitioners who have had little opportunity to become acquainted with the fundamental teaching of osteopathic philosophy.

Other contributions to our publications included research from earlier records from the work of the American pioneers in osteopathic development. In its history of little more than a hundred years, there can be no doubt that the osteopathic concept has made an impact on twentieth century medicine that is more than remarkable, but if we are to continue and retain our separate identity we must look to our past in association with the present in building a secure foundation for the future.



ISBN 9781909052116

